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The Outlook

Aids to Air Safety

NO especial significance should be attached to the fact that it was on April 1st that Lord Nathan, the Minister of Civil Aviation, announced in the House of Lords the steps he is taking towards making air transport safer. The announcement was made in reply to a question by Earl Howe, and there was little that was new among the items outlined by Lord Nathan.

Lord Cherwell's advocacy of F.I.D.O. was understandable and must, we think, be shared by all who have taken the trouble to study the problems connected with landing in really bad visibility. But fog-dispersal, whether F.I.D.O. or some other form, should not at the moment be regarded as other than a last resource when all other means have failed.

In our issue of March 6th, 1947, we published an article on fog dispersal in which were explained not only the principle and operation of F.I.D.O. but also of other systems, such as the American version, "Elmer," which is reported to be a good deal cheaper in running costs, partly because it burns diesel oil instead of petrol. That advantage, by itself, may be of relatively small importance in that the difference in cost between diesel oil and untaxed petrol is not so very great.

There are other systems for which special advantages are claimed, and which were dealt with briefly in the article mentioned. The American "Nofog" and the French system developed along somewhat similar lines depend not on heating but on dehydrating the fog, powdered carbon or charcoal mixed with calcium chloride or some other dehydrant being scattered into the air.

So far as can be ascertained at present, all these systems are likely to prove rather expensive in first cost as well as in operating costs, even if the figures for F.I.D.O. quoted by Lord Nathan can be considerably reduced in future.

Of the radio and radar aids to which the Minister referred there is little to say. They have all been described in this journal at different times and are thus well known to our readers. The important thing is that the Ministry of Civil Aviation is, to use the phrase so popular among politicians, "exploring every avenue." That is as it should be, but it is to be hoped that the period of exploration will have merged into one of extensive general use before next winter; otherwise we are likely to have a repetition of the mishaps which have marred recent months.

Lord Nathan's announcement of the setting-up of a scientific committee with Sir Robert Watson-Watt as consultant and with assistance from the radio industry is all to the good. More doubtful is the Minister's intention to appoint a chief scientific adviser. Such an appointment will place very great powers in the hands of one man, and even if he is, as Lord Nathan said, "of the highest professional eminence," the fact remains that he is still human and thus liable to make mistakes. Having appointed him, the Minister must of necessity accept his advice, and he will need to be a great man in addition to being professionally eminent.

Naval Helicopters

ACCORDING to the New York *Herald Tribune* the United States Navy intends to replace destroyers by helicopters for "plane guard" duties with aircraft carriers at sea. This somewhat staggering bit of information arises out of experience with helicopters during recent U.S. Navy fleet manœuvres in the Atlantic and Caribbean, when a Sikorsky S-51 (the type which is to be built under licence in this country by Westland Aircraft, Ltd.) was used experimentally not only for escort duties but for intra-fleet flights, including mail-carrying.

The suggestion that helicopters could replace escorting destroyers appears at first sight a little far-fetched, but the American experience was not, apparently, a mere

flash in the pan. It seems that the exercises lasted six weeks, during which time the S-51 was in the air for 65 hours on 33 different days, during five of which all other fleet aircraft were grounded because of bad weather or rough seas.

In the course of the exercise several aircrew were picked up by the helicopter, and on one occasion it was very much "the real thing" in that when one aircraft stalled into the water, the observer was killed and the pilot rescued in a dazed condition, which made the operation of getting him on board the helicopter a very difficult one.

If the helicopter can adequately undertake the duties now performed by destroyers in escorting carriers when flying is in progress, the saving in men and money should be very considerable.

The Price We Pay

CIVIL aviation will cost the taxpayer at least £24½ million in 1947-48. That is the somewhat staggering fact disclosed by the Ministry of Civil Aviation section of the Civil Estimates. The gross figure is much larger than this (£32,599,500), but appropriations-in-aid, mostly relief expected from the sale and lease of aircraft, may bring the figure down to the smaller sum. We say may because it appears to us somewhat doubtful.

The largest item in the Estimates is that for civil aircraft and associated equipment (£9 million), but this figure includes an appropriate share of the research and development expenditure incurred by the Ministry of Supply in connection with civil aircraft to be purchased from them by the Ministry of Civil Aviation. Next in size comes the Vote for works, buildings and lands (£8,250,000). As was to be expected, Heathrow will ultimately account for a very large sum (£26 million), the previous estimate of £16 million having proved much too low. Of this total cost it is expected that an expenditure of £3 million will be necessary during 1947-48. Doncaster and Hurn will cost £1 million each, of which about one quarter will be spent during the present financial year. Additional accommodation at Croydon will need £155,000 spent on it.

Large as they are, these figures can at least be regarded as productive. The same cannot be said of some of the other large items, including the grants to B.O.A.C. (£5 million) and B.E.A.C. (£2¼ million), which represent the taxpayer's contribution towards the corporations' deficits. By comparison the grant of £250,000 to British South American Airways Corporation is very modest.

As for the Ministry of Civil Aviation itself, an enormous expansion is evidently contemplated. When one remembers the relatively short time the Ministry has been in existence (beginning with Lord Swinton and a few secretaries) it is surprising, to say the least, that the number of people engaged is expected to reach a total of 5,460 at a cost of £2¼ million in salaries. Nor is this all, for travelling expenses will cost £145,000, the Air Transport Advisory Council £15,000 and aircraft employed on departmental duties £250,000, so that the real cost of the Ministry is likely to be something like £2,660,000.

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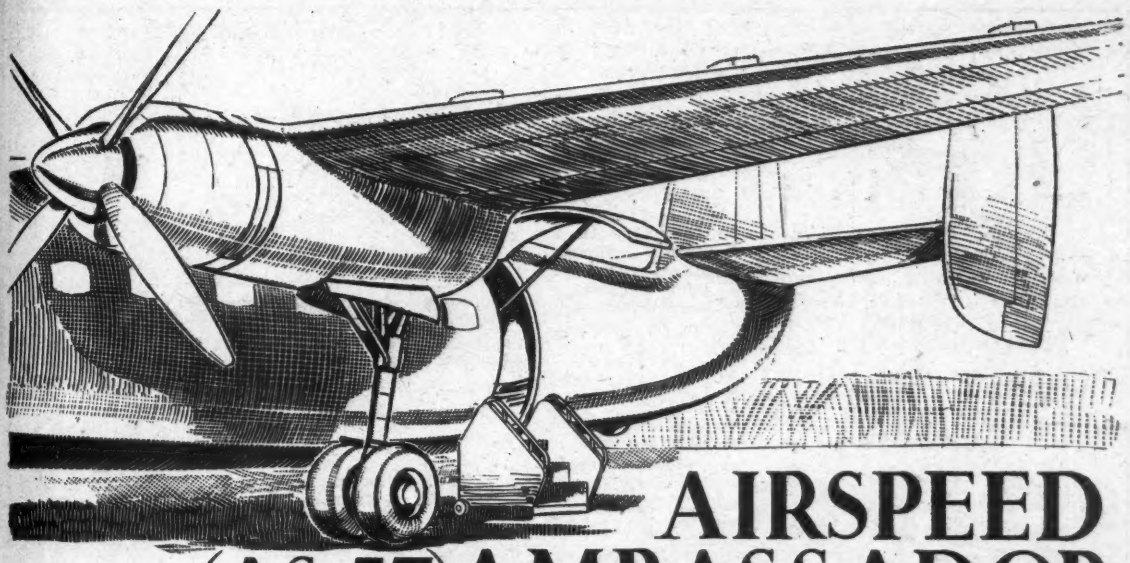
SILENT ELEGANCE: The Short Nimbus sailplane is shown off to fine advantage by this excellent air-to-air shot. Further photographs and a description of the Nimbus appear on pages 317-18.



AIRSPEED (AS.57) AMBASSADOR

Refinement of Design Down to Smallest Detail : Integral Tanks

By C. B. BAILEY-WATSON

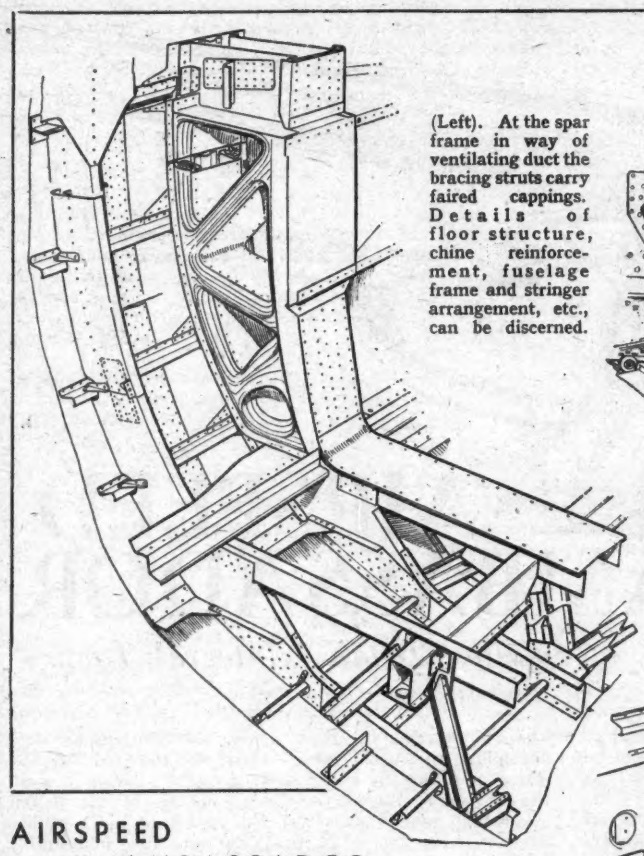
IN relation to its contemporaries—at least, those of more or less orthodox form—the AS.57 Ambassador can be assessed as of considerably advanced design. That is to say, whilst the essential structural layout of the aircraft follows established custom, the design as a whole has been refined to an extent that both commands admiration and places the machine in a class of its own.

Mr. Hagg's past work has shown him to be a very clever designer who is never prepared to accept a compromise involving loss of efficiency just because it offers a simple solution to a difficulty. In the case of the Ambassador, a target was set and the road leading to that target rigidly followed. It is singularly unfortunate that ministerial muddle did not permit the building programme to go ahead with the continuity of purpose shown in the design. Had this not been the case, we should now undoubtedly have seen Ambassadors in the air. However, first flight of the prototype can be expected towards the end of the summer.

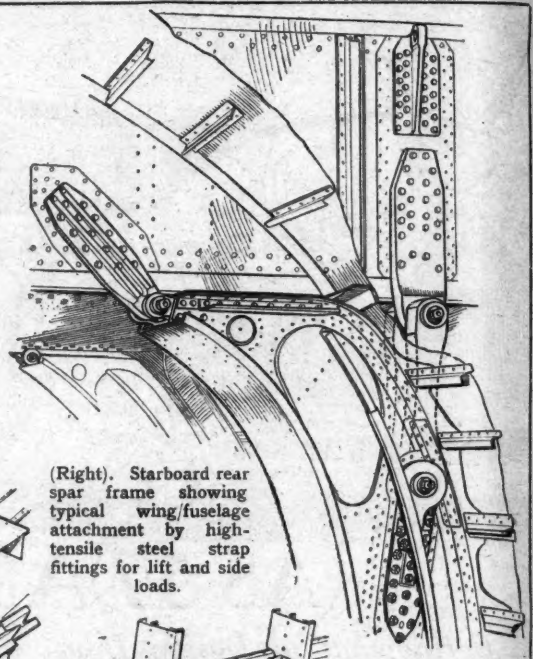
Since most of the latest aircraft, both flying and being built, are of low- or mid-wing type, it is worth while to examine the reasons why the Ambassador does not follow this usual form. First, the required airscrew clearance settles the lowest position of the wing: if a high-wing layout is adopted the fuselage can be roughly 5ft 6in lower than in the low-wing case. Secondly, in a highly stressed wing (such as this) cut-outs are undesirable and the wheels must be housed in the engine nacelles. This itself determines to some extent the relationship of wing and nacelle, it being rounded off by the requirement of a uniform top wing surface. Further, when a tricycle undercarriage is used, a high wing position gives the shortest nosewheel strut, and, in addition, gives the lowest entry-door threshold. Thus we have the basic reasons governing wing/fuselage/nacelle relationship.

The AS.57 wing form was decided upon almost purely from drag considerations, the very high aspect ratio (11) giving a low induced drag, and the thin section giving low form drag. Laminar flow conditions were a desideratum, and a wing of high overhang ratio gives proportionately a greater area in free stream conditions. By similar standards, the use of two engines

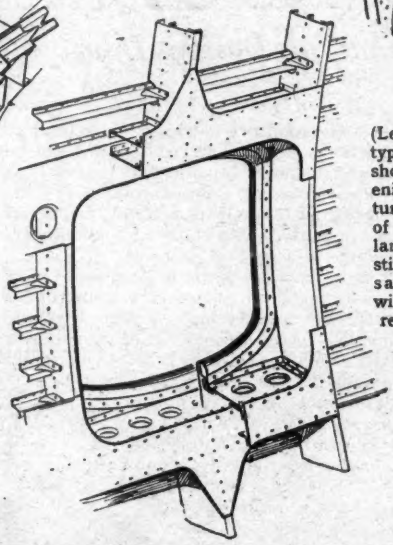
Mr. Arthur Hagg with a fine model from which an excellent impression of the Ambassador may be gained.



(Left). At the spar frame in way of ventilating duct the bracing struts carry faired cappings. Details of floor structure, chine reinforcement, fuselage frame and stringer arrangement, etc., can be discerned.



(Right). Starboard rear spar frame showing typical wing/fuselage attachment by high-tensile steel strap fittings for lift and side loads.



(Left). Detail of typical window showing strengthening box structure and sections of units. The large amount of stiffening is necessary since the window area is relatively great.

AIRSPEED AMBASSADOR

rather than four entails smaller aerodynamic penalties.

Having decided upon what must be regarded as a high-efficiency aircraft, there came the business of designing a structure within the boundaries laid down. It is at this point that, more often than not, battle is waged between the claims of performance and production. In this case there was no battle; the claims of production were not allowed to obtrude. To evaluate and reach a judgment on such a case as this would need a deal of space. But perhaps it is sufficient to say that, since the aircraft is unlikely to be produced in great quantities, the decision not to prostitute the design by compromises for ease of production is undeniably a right one.

Economy is Efficiency

It should not be assumed from these remarks that the aircraft is particularly difficult to make; it is not. But it certainly cannot be classified as a "production" machine. If, for example, an order for 50 Ambassadors is placed, the initial cost is likely to be a little higher than would apply were the aircraft less refined. But, by the same token, a "coarser" machine would not have the Ambassador's qualities to offer. Just as Kelvin's dictum "science is measurement" is a truism, so also can it be postulated that economy is efficiency; on this basis we feel that Airspeeds have taken the right course, for although the AS.57 might cost slightly more initially than a rival aircraft, the greater efficiency should pay for the higher first cost in a fairly short time, and the best is, as with almost every other commodity, cheapest in the long run.

In æsthetic terms the Ambassador is a very beautiful aircraft indeed, its quality of line bespeaking the thoroughbred with that indefinable something which, however intangible, is immediately recognizable.

One of the first noticeable things that strikes the observer when examining the aircraft is the relative paucity of extruded sections used in its composition; there was, however, no deliberate intention to avoid the use of such members and the fact is merely noted with interest.

Viewing the machine as a composition, the wings and fuselage can be broken down into quite separate units which are joined by very simple attachments at the centre section. Taking the fuselage first, the initial impression one obtains is that of a basically orthodox structure of frames and stringers, seemingly complicated by the rather elaborate stiffening provided at the window and door cut-outs. This is a case in point of the lack of extrusions; quite obviously where cut-outs of relatively large area occur in a stressed fabric they have to be surrounded by somewhat heavier structure to balance, and this is usually provided in the form of extrusions. In the Ambassador case, however, a rather complicated boxed fabrication is employed. This may possibly be lighter than a complementary case using extrusions. Without going into the details very fully it is not possible to judge, but it is details like this that preclude the aircraft being assessed as a "production" machine.

In considering the wings, it is found that here more than anywhere does the Ambassador differ from accepted design practice. First, the skin panels are thick, being designed to take, with the stringers, some 87 per cent of the wing bending loads; secondly, centre-section/outer wing jointing is solely through the skins, the spars having no bolted joint; thirdly, the main fuel tankage is integral at the inner end of each wing panel.

Since this is purely a structural appraisal of the Ambassador we are not concerned here with the accommodation layout as such; suffice to say that the flight deck is well proportioned and the space available for passenger accommodation seems very much larger than would appear from an external view of the aircraft.

Fuselage Structure

In section the greater part of the fuselage is circular with a "flattened" base curvature, the intersection of the arcs producing chines which extend roughly from the control cabin back to the rear baggage door, the angle dying into the changing sectional contours of the nose and tail regions. Structurally the fuselage is fairly conventional with rolled channel frames which are notched for the Z-section stringers, to which they are secured with shear cleats. Stringers are separated in groups of four by T-section extruded stringer/longerons, and the frames are quadrantly stiffened by angle strips on free flanges and webs. Reinforcement at the chines is provided by doubling strips which are not continuous but are intercostal to the floor frames, and attached to them with angle clips.

Naturally enough, the fuselage frames at spar stations are very massive and take the form of built-up box members which run from the base of the centre-section spars down to the chines, the proportions of these members having been governed by their requirement to take the wing loads in the event of a belly landing. Wing/fuselage attachment is primarily made by means of duplicated strap-fittings port and starboard to each spar and spar frame, the respective pick-up points forming triangles. The outboard (vertical) fittings take lift loads, and the inboard (diagonal) fittings take side loads. Drag loads are taken as shear by the rivets attaching heavy-gauge flanged-angle members which pick-up to the inside of the fuselage skin and the under-surface of the centre-section where these two intersect. In the same connection, fore and aft-box section members riveted to the webs of the three central ribs in the centre-section terminate in fork-and-lug anchorages to the fuselage roof structure forward and rearward of the centre-section; their function is to transmit longitudinal loads across the fuselage where it is cut away for the centre-section.

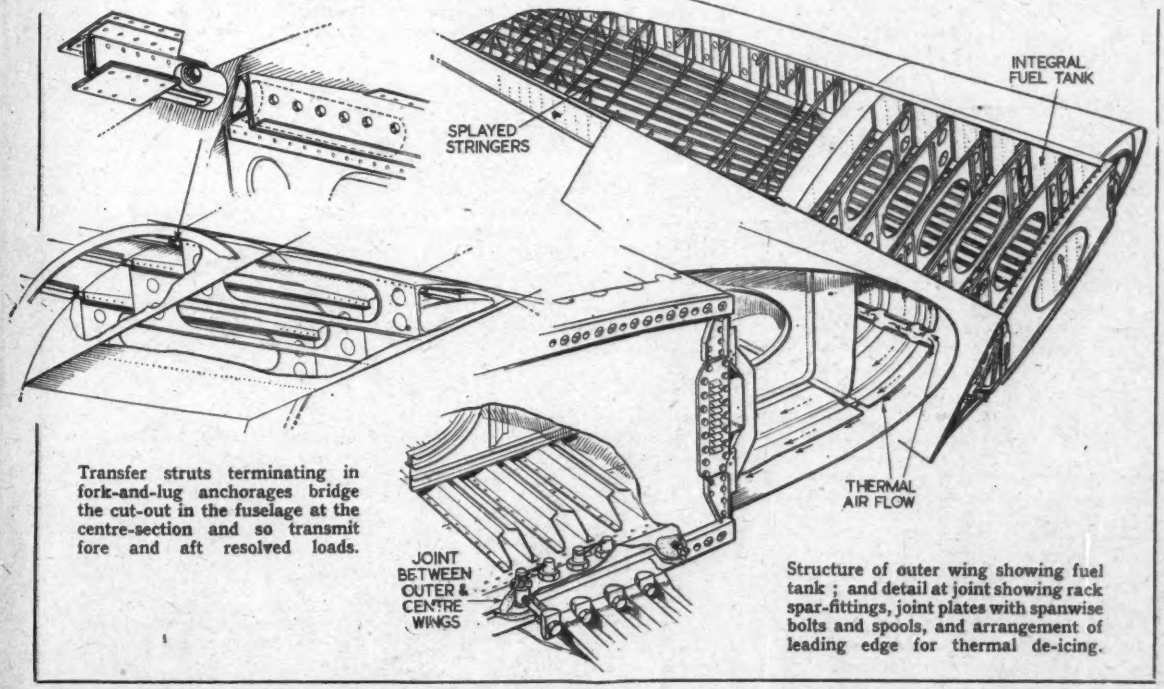
A dado in the form of a boxed duct runs along each fuselage wall, the shelf top being about six inches below the base line of the windows. This is a ventilating duct, and a pointer to detail design which exemplifies the striving for efficiency so notable in the Ambassador is that, where the duct intersects the fuselage spar frames, the webs are cut away in the form of a W-bracing, and each bracing "strut" is fitted with a streamlined capping of laminated wood to reduce drag and, therefore, effect the least flow losses in the duct.

The fuselage cross-sectional contour changes rapidly toward the tail, but the structure remains essentially the same, and although the frames are very light and their webs are pierced by lightening holes, by contrast the stringer spacing is quite close. A non-stressed bulkhead separates the main cabin from the rear baggage compartment, the floor of which is raised about four inches above the main level. Passenger entry is through an upward-opening door at the rear of the cabin on the port side, ingenious jury struts being integral fixtures. Access to the baggage compartment from outside is via a door about 3ft square just above floor level to starboard.

Pressurized Second Prototype

Although the first prototype is not being built for cabin pressurizing, the second aircraft will be so constructed. In point of fact, structurally there will be little difference, the basic design being the same: it merely means that the first machine will not have pressure bulkheads, sealing measures, etc.

Headroom in the cabin beneath the wing is a minimum of 6ft 4½in, the cabin roof being swept gracefully down to the under-surface of the centre-section. This portion of the wing is 35ft in span, and it is built up on two plate web spars with extruded L-section booms: the free flanges of the latter are of constant thickness across the fuselage



Transfer struts terminating in fork-and-lug anchorages bridge the cut-out in the fuselage at the centre-section and so transmit fore and aft resolved loads.

Structure of outer wing showing fuel tank; and detail at joint showing rack spar-fittings, joint plates with spanwise bolts and spools, and arrangement of leading edge for thermal de-icing.

AIRSPEED AMBASSADOR

span but from thence to the outboard ends are taper-machined. Stringers are all full-span members, those to the top surface being top-hat extrusions, whilst Z-extrusions are used for the lower surface. Pitching centre-to-centre of the top stringers is 4.6in, and that of the lower members 3.14in, all being parallel throughout their span.

Generally, inter-spar ribs are diaphragm-type units, but in way of each nacelle are five ribs with their diaphragms cut away for auxiliary fuel tanks. The tanks—which, when used, will be of bag type—are housed in a tunnel through the ribs. Leading edge structure between the fuselage and nacelles is of unit type with access doors hinged forward in the lower surface: the skin is 16g carried on pressed sheet ribs and stiffened with L-intercostals.

Wing Joint Details

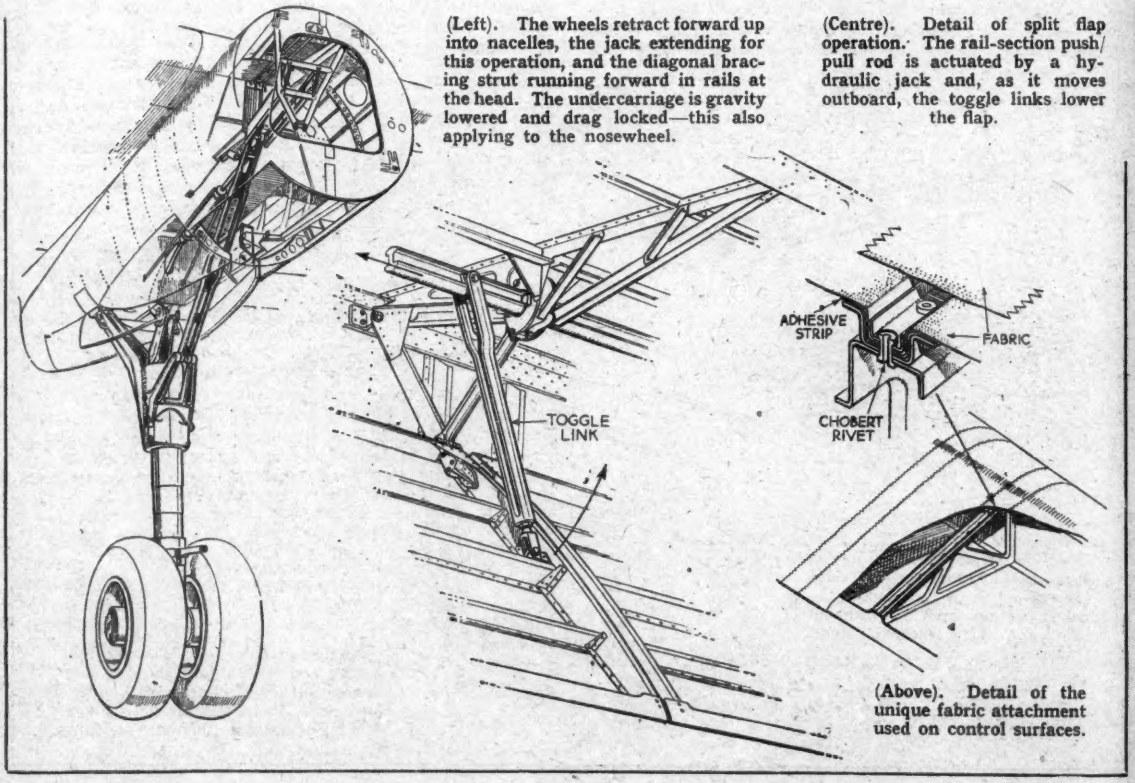
As mentioned, the joint between the centre-section and outer wing panels is actually made through the skins; there is no connection between the spars as normally known, but, instead, there are serrated fittings for transmitting lift and torsion loads. Bending loads developed as tensiles and compressions in stringers and skin surfaces are transferred through upper and lower joint plates at the outboard ends of the centre-section and inboard ends of the outer wings, the joint plates being edge-bolted together spanwise as shown in the detail sketch. Skin panels are continuous up to the joint, and the Z-section stringers are carried up over the "ramp" of the joint plates and through-riveted to the skin. The joint plates on the centre-section have milled slots for the attachment bolts ($\frac{7}{16}$in dia. bottom, and $\frac{3}{8}$in dia. top) which are of HT steel and screw into vertical spools housed in the complementing joint plates on the outer wing panels. A steel dome nut with a knife-edge rim screws on to the spool spigot and bites into the dural joint plate to effect a fuel seal, since the outer wing joint plates are inside the integral fuel tanks.

The serrated racks uniting the spars are arranged thus: at the joint, extruded T-section vertical members are fitted at the junction of spar and end-rib, the flanges of the T picking up to the rib web with the leg of the T riveted to the spar web. The rack fittings are through-bolted to the rib web and T flanges.

Outer wing spars are of plate web type with L-section extruded booms, the leg lengths, or depths, of the booms being progressively machined away spanwise although the sectional thickness remains constant. The spar webs form the fore and aft walls of the integral tanks and, as thermal de-icing is provided for the leading edge, an insulating cavity is left between the front spar web and the spanwise hot-air-sealing diaphragm, this cavity being ventilated by forced draught. Obviously a heat-insulating diaphragm is necessary to prevent fuel boiling, and the forced-draught ventilation will preclude transmission of warmth and carry away any seepage fumes if they occur.

One is inclined at first to question this feature of integral fuel tanks in view of the seeming elaboration necessary, although the only complication is one of careful design to avoid leak paths which need to be sealed. The fact that to use even bag-type tanks in this very thin wing would have reduced the effective capacity to 300 gallons per side instead of 500 gallons is as telling an answer as one could wish, quite irrespective of the saving of weight. Sealing is very simple, the use of rubber pads being confined to the corners; however, a special Bostick solution is swilled round the inside and then tipped out, so leaving a sealing membrane.

Chordal ribs in the tanks have plate webs with internal cut-outs, and act as anti-surge baffles whilst permitting internal access. Rib webs ride on the free flanges of the stringers, the fuel flowing between rib chambers through the cut-outs and inter-stringer spaces. Outboard of the tanks the inter-spar ribs are very light warren-girder braced members. Stringers are Z-extrusions top and bottom, and are "fanned" at roughly $\frac{1}{4}$ deg increments relative to the front spar, the pitch being slightly closer for the top stringers



(Left). The wheels retract forward up into nacelles, the jack extending for this operation, and the diagonal bracing strut running forward in rails at the head. The undercarriage is gravity lowered and drag locked—this also applying to the nosewheel.

(Centre). Detail of split flap operation. The rail-section push/pull rod is actuated by a hydraulic jack and, as it moves outboard, the toggle links lower the flap.

(Above). Detail of the unique fabric attachment used on control surfaces.

than for the bottom Wing skinning is as follows: tank and centre-section skin panels are respectively 14g top and 16g bottom; outboard of the tanks the top skinning is 16g for the inner and outer panels, and 16 and 18g respectively for the bottom inner and outer panels.

The leading-edge structure has a single wrapped skin and, inside this, a corrugated inner skin. This is supported on pressed sheet nose ribs forward of which is the spanwise thermal duct, the hot air flowing between corrugations and outer skin to preclude ice accretion. Similar treatment is applied to the leading edges of the tail surfaces.

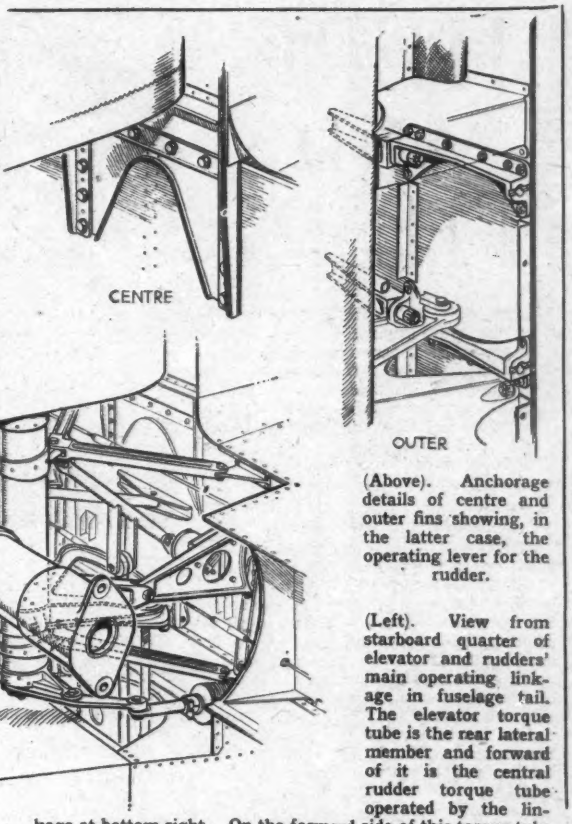
Tail Structure

The tailplane is a two-spar structure with pressed sheet chordal ribs and Z section stringers. Attachment to the fuselage is by vertical blade forgings—two per spar—the upper and lower blades being united by a single vertical bolt. End-fin construction comprises two spars spanned by pressed sheet ribs with Z-section stringers. These fins are interchangeable and are anchored to the tailplane spars by lateral versions of the vertical blade forgings used at the tailplane/fuselage joint. The central fin is structurally similar to its outer fellows, and is anchored to the tailplane spars.

Rudders are essentially similar in construction to all the other control surfaces, being monospar and braced-rib units with metal-skinned torsion-box leading-edges. Aft of the spar the surface is of fabric attached in a unique manner: the rib contour flanges carry a top-hat section member and the fabric is pressed down into the groove by an external channel member, this being Chobert-riveted through the fabric to the rib, the whole being enclosed by a doped-on fabric cover strip. A very neat job.

Control surface tabs are, in general, of conventional geared balance and trim type, but the central rudder carries a torsion spring-tab the spring anchorage being adjustable for rudder trimming. Input motion moves the rudder through the spring tap only for the first five degrees port and starboard: integral stops then make the drive effectively solid.

The control system, in brief, is designed to give very low static friction, and, at the same time to provide integral compensation for lost motion and temperature change. Control motion at the cockpit is translated by linkages to push/pull rods terminating in racks which mesh with pinions driving cable pulleys, the difference in pinion and pulley diameters giving a linear ratio of 5:1, i.e., one inch push/pull rod travel will give five inches cable travel. The object of this is to make cable stretch uncritical within fairly wide limits, and similarly permit wider temperature tolerances As the control surface loadings limit to 120 lb the maximum tensile stress which can be put in a cable, very light and, therefore, small diameter cables can be used. With reasonable pulley diameters friction can be reduced to negligible proportions. Translation of cable motion to control-surface movement is by means of similar rack and pinion units for rudders and elevators, but for the ailerons the cables drive ball-bearing screw jacks.



(Above). Anchorage details of centre and outer fins showing, in the latter case, the operating lever for the rudder.

(Left). View from starboard quarter of elevator and rudders' main operating linkage in fuselage tail. The elevator torque tube is the rear lateral member and forward of it is the central rudder torque tube operated by the linkage at bottom right. On the forward side of this torque tube is carried a quadrant around which are wrapped, and attached, the tie-rod cables to the outer rudders.

AS.57 AMBASSADOR DATA
Two Bristol Centaurus 631 engines of 3,000 b.h.p. each driving 16ft dia. 4-blade airscrews

Span	115ft 0in
Length	80ft 3in
Height	18ft 10in
Wing area	1,200 sq ft
Aspect ratio	11
Aerofoil	N.A.C.A 65, 415
Dihedral	1 deg 22 min
Incidence	2 deg 5 min
T/p span	30ft 6in
T/p and elevator area	198.8 sq ft
Fin and rudder area, gross	158 sq ft
Flaps area	82 sq ft/wing
Gross weight	49,500 lb
Wing loading	41.25 lb/sq ft
Power loading, normal cruise	19.0 lb/b.h.p.
Percentage structure weight	32.8
Useful load : tare wt. ratio	0.245 : 1
Max. cont. W.M. cruise	280 m.p.h at 10,000ft
Recommended econ. cruise : (60% METO)	250 " 10,000ft
Recommended cruise, 1 engine dead	195 " 10,000ft

Payload	Range	Speed	Altitude
9,720 lb for	1,200 miles	at 245 m.p.h	at 7,000ft
7,680 "	1,640 "	245 "	7,000ft (full perm. tanks)
2,960 "	2,600 "	245 "	7,000ft (+2×300 gall. aux. tanks)

THE BLACKPOOL PAGEANT

THE Air League announces that a change in the dates of the Pageant at Blackpool has been made necessary by the operational commitments of the R.A.F. The air exhibition will be open at Squire's Gate airport from July 2nd to July 23rd inclusive. Flying displays in connection with the exhibition will be given on three Wednesdays: July 2nd, 9th and 16th.

LANDPLANE v. FLYING-BOAT

WHEN Mr. A. E. Russell, Bristol's chief aircraft designer, lectured to the Isle of Wight Branch of the Royal Aeronautical Society (a revised version of his recent lecture to the R.Ae.S., he dealt at length with the Brabazon I). he illustrated undercarriage problems of the square-cube-law variety by pointing out that if an elephant was doubled in size, the weight would be increased eight times and the loading on its feet would be doubled, and so it would sink into the mud.

Mr. Henry Knowler, Saunders-Roe's chief designer and chairman of the Branch Society, retorted by calling attention to the fact that the flying-boat suffers from no such disadvantage with increasing size, and he drew an apt comparison with a whale. Mr. Russell, in a good-humoured reply, admitted that it seemed that, like the elephant, he had "put his foot in it."

In view of the fact that Mr. Russell has designed our largest landplane and Mr. Knowler our largest flying boat, it will be appreciated that, apart from this gentle leg pulling, there was intense interest in the technical aspects of the lecture

HERE AND THERE

"Flight" photograph.

LIFE OF THE PARTY: As described on our centre pages, F/O. "Nick" Carter of 247 Squadron demonstrated his Vampire to such good effect at Halton recently, that, supported by S/L. Cable on a Hoverfly, he saved our Soviet visitors from an afternoon of gloom and boredom. He is seen receiving the congratulations of Col.-Gen. Gromov, twice Hero of the Soviet Union.

Crimson Airports

AIRPORTS were constructed in the far north of Canada during the war to allow fighter aircraft to fly, by a series of hops, to England. It was known as the "Crimson Route." Some of these airports, including The Pas, are to be used by the R.C.A.F. this summer for making the annual photographic survey of the far north. Churchill Airport is still maintained to supply the Army testing station. Coral Harbour, on Southampton Island, has a radio range beacon and supplies weather information.

Viscount Alexander—Pilot

SPEAKING at a dinner following the 18th annual meeting of the Royal Canadian Flying Clubs Association (which numbers forty-two clubs in its membership), the Governor-General of Canada, Viscount Alexander, revealed that he has more than 200 hours on his log book—not solo, of course, but he takes over the controls whenever he gets the chance, and he hopes to get his "ticket" next summer. Viscount Alexander disclosed the fact that on the return flight from Yalta he piloted Mr. Churchill for a time, "but nobody knew it, of course," he added.

Much Binding

COPIES of the index to volume 50 of *Flight* (July to December, 1946) are now available price 1s 1½d post free, or together with binding case at 5s 4d post free.

Readers' copies can be bound at an inclusive cost of 15s plus 9d per volume return postage. It is expected, however, that there will be some delay in binding at the present time.

TOP TABLE: Some of the prominent hosts and guests at No. 83 Group's second annual reunion. Left to right, A.V-M. Sir Basil Embry, G/C. C. S. Morice, Air Marshal Sir Hugh L. Saunders (Guest of Honour), Air Marshal Sir William F. Dickson (President of the Association), Air Marshal Sir Arthur Coningham, A. Cdre. Sir Harry Broadhurst and A.V-M. V. E. Groom. Some comments from the speeches appear on page 318.

Canadienne Representative

MRS MACGILL SOULSBY, wife of Mr. E. J. Soulsby, the assistant general manager of A. V. Roe, Canada, is one of the Canadian representatives on P.I.C.A.O. technical committees. Mrs. Soulsby does aeronautical consulting work, and was at one time chief aeronautical engineer of the Canadian Car and Foundry plant at Fort William. She was the first woman in the world to receive a master's degree in aeronautical engineering. She is also the first, and probably the only, woman to design, build and test her own aircraft.

Leg-up for Freighters

THE Bristol Freighter G-AGVC, which made a tour of the Americas last year, went straight into service with Canadian Pacific Airways at the end of the tour. During the hard winter it was landing on the frozen Knob Lake, Labrador, in a blizzard and damaged an undercarriage leg. A transatlantic telephone call to Bristols followed, and a new leg was sent off to Heathrow over ice-bound roads. There the leg was put on board a Trans-Canada aircraft, flown to Montreal, transferred to another aircraft which took it to Knob Lake, where it was fitted to the Freighter by mechanics working all night. The next day it was flown off the lake ice.

Portrait of Britannia

REPLYING to a question in the House the Secretary of State for Air stated that the Royal Air Force had made air photographs of about two-thirds of the United Kingdom. Because this photography can only be done by special aircraft and crews in clear weather it is not keeping pace with the demands from the Ministry of Town and Country Planning and other departments. The sale of these photographs to the general public is being considered.

A Week in the Air

WITH the complete absence of airship flying in Europe, there is a tendency to regard this type of aircraft as "dead." In the United States, however, small non-rigid airships are still used to a considerable extent, and recently a Goodyear "blimp" remained

HERE AND THERE

in the air for 7 days, 2 hours and 18 minutes without landing and without refuelling. It is to be assumed that much of the time was spent with engine throttled right down or even stopped altogether.

Soviet Air Transport

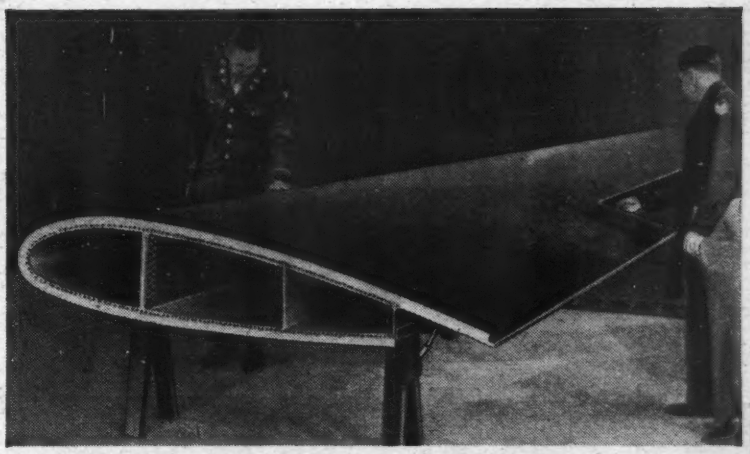
ACCORDING to the Russian journal *Isvestia*, Soviet passenger air transport has greatly increased during recent months, and the total volume of freight delivered by air within the U.S.S.R. is now five times greater than before the war. Great importance is attached to the expansion of air communications with health resorts in the south, and connections to Moscow, Prague, Stockholm and other cities are being improved.

Radar in Canada

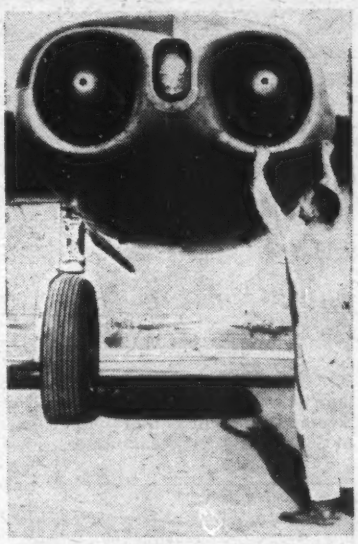
LONG-RANGE radar stations are to be built by Canada in the far north this summer. Mr. Louis St. Laurent, Minister for External Affairs, who made this announcement, did not disclose the exact locations of the two stations, but stated that they will be operated in conjunction with other stations in U.S. territory (presumably in Alaska). The stations will help air and marine navigation, and American personnel are to lend a hand until such time as Canadians can be trained for the work.

Airport Transport

SEVERAL advantages are claimed for electric propulsion of airport vehicles, not the least being absence of fire risk. Recently, Mr. Lindgren, Parliamentary Secretary of the Ministry of Civil Aviation, witnessed at Heathrow a demonstration of several Morrison-Electricars. These vehicles combine maximum loading space with convenient loading height and are suitable for passengers as well as luggage. The demonstration was also attended by Air Marshal Sir John d'Albiac, commandant, and Mr. R. C. Pugh, airport manager, and by representatives of the principal air lines. Mr. Lindgren drove one of the vehicles by way of a trial.



FOR SMOOTH ENTRY: An aircraft wing, built entirely of glass fibre, recently tested in America. It was found to be up to strength requirements but no weight figures have been issued.



LIGHT AND POWER: On the North American XB-45 four-jet bomber prototype, now on test for the U.S. Army at Muroc Dry Lake, a landing light is installed between the two jet intakes.

ELECTRICAL PROPULSION: One of the battery-driven vehicles demonstrated at Heathrow recently to show the suitabilty of electric vehicles for airport work. The aircraft in the background is a Canadian Lancastrian.

News in Brief

OUR contemporary, *Canadian Aviation*, reports that Air Spray, Ltd., a subsidiary of the Hunting group, is buying a Bell helicopter to investigate its use in pest control.

* * *

The same journal states that in the Royal Navy cold-weather tests of flying equipment the engine of the Vampire was found to freeze at a temperature of 54 deg C below zero.

* * *

After being withdrawn from service since last October, the "Languedoc"-161 has been reinstated. It is now fitted with de-icing equipment, and four machines of the type are in service on Air France's Paris-Oran-Casablanca route.

* * *

Mr. H. R. Haerle has been appointed technical manager, and Mr. D. A. Higgs engineering sales manager, of the Hymatic Engineering Co., Ltd., of Redditch, the makers of compressed-air equipment for aircraft.

* * *

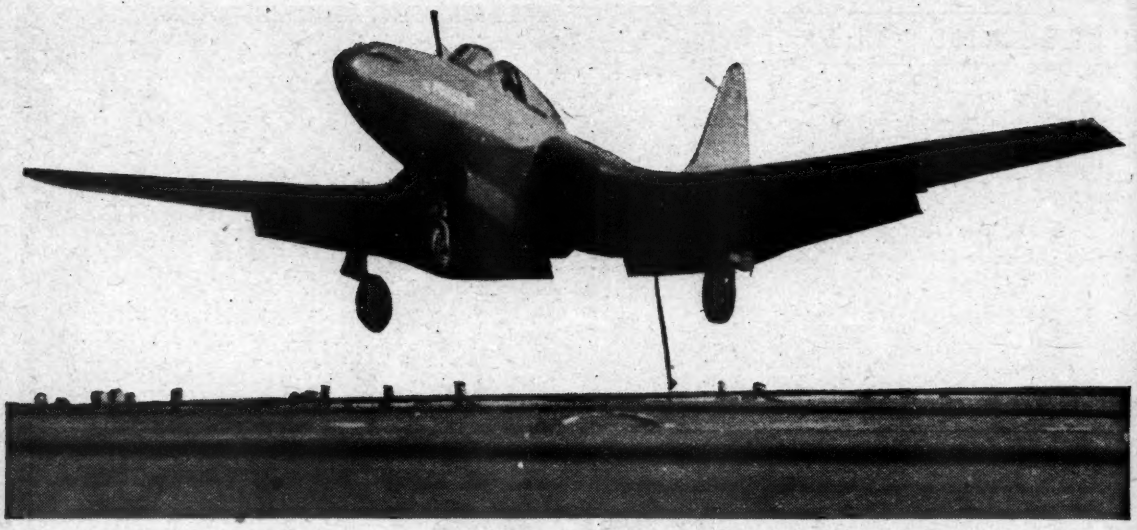
Mr. W. F. List, who has joined the board of directors of C. C. Wakefield and Co., Ltd., has spent some 20 years in India and South Africa managing Castrol affairs. Mr. L. M. Broadway, who has been with the firm for 27 years, has also been made a director.

* * *

Changes at Portsmouth Aviation, Ltd., are that Mr. Edgar Granville has become chairman and managing director, while Mr. L. M. J. Balfour becomes vice-chairman and managing director. Mr. D. Escott, formerly general manager, has joined the board as works director.

* * *

W. S. Shackleton, Ltd., announce the return to the firm after war service of S/L. Beard, Mr. Shackleton's co-director, and Mr. S. Mallett, the firm's accountant. Mr. W. H. Boultwood, who is in engineering sales, has been with Shackleton longer than any other member of the staff, and finally Mr. Keith Shackleton, who has made quite a name for himself as an artist, has joined the newly formed marine department.



The first prototype of the McDonnell Phantom during deck-landing trials aboard U.S.S. *Franklin D. Roosevelt.*

Phantom Development

The Story of the Birth and Evolution of the First Jet Fighter for the U.S. Navy

By JOHN W. R. TAYLOR

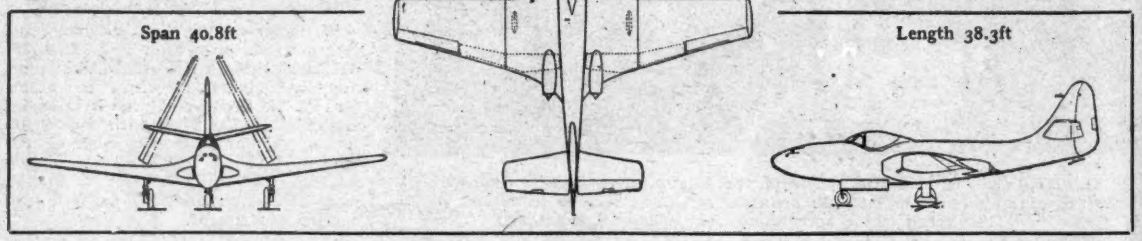
THE story of the McDonnell Phantom starts a few weeks after the tragedy at Pearl Harbour. Here in Britain, thanks largely to the initiative and foresight of a small number of men like Frank Whittle, the Gloster E 28/39 had already flown and proved jet-propulsion to be not merely an attractive theory but a very practicable fact. There was good reason to believe that both Britain and Germany had jet-propelled fighters on the way, while some American squadrons still flew two-gun fighters with speeds of less than 300 m.p.h. Obviously America could expect technical assistance from us now that she was in the war, but it was equally obvious that her own industry would have to get busy on designing jet-engines and airframes.

IN planning the XFD-1 many alternative schemes were examined, including six, four and two jet engines. Ultimately the twin-engine arrangement was chosen as offering the best all-round compromise between conflicting requirements.

The author wishes to acknowledge the assistance he has received from the technicians of the McDonnell Aircraft Corporation in the preparation of these notes.

As a result, officials of the U.S. Navy's Bureau of Aeronautics first of all awarded a contract for a number of prototype engines to the Westinghouse Electric Corporation. They were to be simple, single-stage, axial-flow turbines of very small diameter, in contrast with most British jet-engines of that time, which were of the centrifugal compressor type. It was realized that these Westinghouse engines would give a relatively small thrust, but it was believed that this would be offset by the fact that their small frontal area would permit a number of engines to be mounted inside a fighter's wing without seriously affecting airflow characteristics.

By the beginning of 1943 Westinghouse had made considerable progress with the engine side of things, and the next job was to design an efficient airframe. The Bureau of Aeronautics decided to call on the services of the McDonnell Aircraft Corporation, the resultant joint effort to be designated XFD-1. The designers set out to produce the smallest possible fighter that would satisfactorily carry a pilot, four 0.50-inch guns and their ammunition for a specified length of time. Weight, wing area and even engine power were treated as secondary considerations. Everything was to be kept as simple as possible with no "frills" or unnecessary gadgets to complicate production. Attractive but unorthodox ideas such as a tailless or tail-first layout (to keep the tail out of the way of the jet exhaust) or a prone position for the pilot were quickly put aside, as it was wisely considered that it was difficult



enough to design an aircraft round engines which had never been proved or even built without wasting possibly further years of precious time on developing a radically new airframe. So, from the start, the XFD-1 was conceived with a fairly orthodox general layout, all possible research and ingenuity being directed to providing the most efficient engine installation possible.

At that time it was thought that jet-engines could be "tailored" to suit the aircraft in which they were to be mounted, and that their thrust would be in a simple ratio to their diameter. This was in direct contrast to the conventional idea of designing the airframe round the engine and has, unfortunately, proved to be rather wishful thinking, for the present at any rate. But, because of that belief, the design team set out first of all to decide how many engines to install in their projected fighter, and the preliminary design layouts depicted a neat little low-wing monoplane with no fewer than six engines. They each had a diameter of only 9½ inches and could be mounted completely inside the wings, except for the tail-pipes which projected at the trailing-edge. By providing air intakes in the leading edges a simple, straight-through airflow was obtained.

It was estimated that each engine would give some 275-340 lb thrust, which would give a total power output greater than that of any contemporary American fighter. An endurance of 45 minutes at full power was considered

Showing the thickening of the wing roots to house the intakes for the twin Westinghouse power units.

necessary, and it was calculated that an economical cruising speed would be achieved by stopping two engines and running the other four at just under their maximum output. At an estimated all-up weight of 6,600 lb, and with a wing area of 187 sq ft, it was thought that this machine would have a good speed and rate of climb, and would stall at under 70 knots.

Unfortunately its wing and power loadings turned out too high and so McDonnells were asked to consider a somewhat larger machine with a wing area of 230 sq ft and with six, eight or even ten 9½-in diameter engines. They discovered that the eight-engined version would give the best results, but decided further to compare the estimated performance of this layout with that of similar aircraft with six 11-in diameter engines, four 13½in, or two 19in, assuming the power output of each installation to give approximately the same total thrust. This comparison proved conclusively the all-round superiority of the twin-engined arrangement.

It was not considered practicable to design the fighter round a single engine, as Westinghouse pointed out that their engines were still very much in the experimental stage and they did not like the idea of promising anything too big and powerful until smaller units had been thoroughly tested.

The original Phantom project, with six 9½-inch Westinghouse turbine jets mounted in the wing.

The twin-engined layout saved some 300 lb in weight over the eight-engined version, which meant improved performance. From the pilot's point of view it meant fewer controls and instruments in the cockpit, and from the standpoints of production and maintenance it meant very much simplified wing structure and fuel and other systems. This latter consideration was particularly important in the case of the XFD-1 as, being a carrier-based fighter, it had to have folding wings. Consequently, unless the folded width was made undesirably large, some of the engines in an eight-engined layout would have had to be outboard of the break. This would have necessitated "folding" engine controls and pipe-lines, a feature that would hardly prove popular with designers, fitters or "erks."

Engine Location

Having decided on two 19½-in diameter engines, the next problems were where to put them and how to arrange their air intakes. Their small size and weight opened up many attractive possibilities, each of which was tested in turn both by calculation and with the aid of wind-tunnel models. The simplest solution was to put the engines in nacelles under the wings, but this seemed to give a needless increase in frontal area and drag. In addition, it was realized that the further inboard the motors could be mounted the better would be the fighter's manœuvrability. In fact, from the point of view of manœuvrability alone a side-by-side instal-

Tests showed that the jet tail pipes might have been located even closer inboard without burning the fuselage sides.

PHANTOM DEVELOPMENT

lation in the fuselage would have been ideal, but this meant a loss in aerodynamic efficiency as the air intake ducts would have to be either very long or curved.

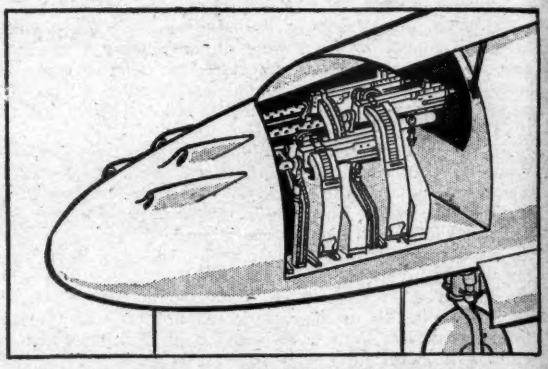
In addition, as the fuselage was to be quite small, it would have necessitated carrying most of the fuel in the wings; this would have involved complicating the wing structure to provide large unobstructed tank bays, making the tanks themselves in awkward shapes and almost doubling the amount of fuel system "plumbing," all of which was bad from the production angle. So McDonnells finally chose a position for the engines for which they must have had a secret preference all the time—enlarged wing fillets. They had used the same idea in their XP-67 twin-engined fighter, to house fuel and ammunition, and had found that it offered many aerodynamic advantages. The weight was kept well inboard and, by careful design, the structure weighed less and offered less drag than an enlarged fuselage or bulged wing. The problem of housing the main undercarriage wheels when retracted also ceased to offer any headaches, even with outer wings of thin aerofoil section.

Fillet Behaviour

There was at first some doubt as to how these fillets would affect airflow at high Mach numbers. Again wind-tunnel models provided the answer, and it was found that, provided the air intake ducts in the leading edge of the fillets were carefully designed, they still offered very definite advantages over nose, "elephant ear" or under-wing intakes. Tests in the N.A.C.A. tunnel showed that over the fillet the critical Mach number was considerably better than over the basic wing. The most apparent explanation for this is that, as the air enters the leading edge at the fillet, this in effect splits the one thick wing into two aerodynamically thin ones, added to which the maximum depth line of the aerofoil section sweeps back at the fillet so giving a better "laminar flow" effect. All of which is most satisfactory and, naturally, the extra depth of the inboard portion of the wing gives the whole wing additional rigidity. Much time was spent in evolving the best possible inlet duct; the result is a nice-looking and aerodynamically good intake that may well provide inspiration for future jet-fighter designs.

Once the engine installation was all settled, the rest of the design work was quite simple. The centre fuselage

Air Commodore Whittle in the cockpit of a Phantom. With him is Mr. James S. McDonnell, President of the manufacturing company



A typical American gun installation (four grouped 0.5in. Brownings) characterizes the Phantom.

and fillets were made as a single very strong unit, the nose and tail portions of the fuselage being simple monocoque structures, and the wings were designed to fold backwards immediately outboard of the fillets. A tricycle undercarriage was an obvious choice as, apart from all the usual advantages claimed for this arrangement, there were considerable misgivings about the effect of jet exhaust upon the wooden flight decks of carriers. The wide track of the main wheels was considered necessary for landing-on, and a deck-landing arrester hook was fitted under the rear fuselage.

The four "point-fives" were mounted in the nose of the fuselage, the installation being very similar to that of the Messerschmitt 262 jet-fighter. This has the advantage of bringing their line of fire close to the pilot's line of sight and also makes them easily accessible from ground level for servicing operations. As usual with jet-fighters, it was possible to put the cockpit well forward of the wing, giving an excellent field of view through the now customary "bubble" canopy. Aft of the cockpit were fitted the three large self-sealing fuel tanks, separated from the pilot by substantial armour plate and firewalls. The tail unit remained fairly orthodox, although the tailplane was given a small dihedral to clear the jet exhaust.

First Flight on One Engine

By January, 1945, the last drawings had been finished, the last airframe parts made and assembled. Finally, the whole machine was given a very smooth high-gloss finish and was ready for its first flight, but . . . only one engine was ready for installation. McDonnells had such confidence in their XFD-1, however, that, after a few ground runs and taxying tests, they decided to make the first flight on just the one engine. This test was completely successful and showed that, because its engines were so close inboard, the XFD-1 had an almost negligible yawing movement on one engine—a fact that could easily save a pilot's life if an engine got shot up in action or failed during take-off.

Soon the second engine was installed and the serious test-flight programme began. Meanwhile the fighter had acquired the name of Phantom and the engine the designation Westinghouse 19B. It soon proved itself capable of speeds well over 500 m.p.h., combined with low-speed flying characteristics comparable with those of any conventional carrier-based fighter. Its cruising range proved better than 1,000 miles and its service ceiling over 35,000 feet. McDonnells and the U.S. Navy had a fighter to be proud of. Then came the day, July 21st, 1946, when the prototype made its first landings and take-offs from the *Franklin D. Roosevelt*. The rest of the story is still being written.

N.B.—In describing the Phantom's armament installation as being "very similar to that of the Messerschmitt 262" Mr. Taylor is referring only to the disposition of the guns. The Messerschmitt, of course, with its four 30 mm high-capacity, low-velocity MK108 guns, was greatly superior in fire power.—Ed.

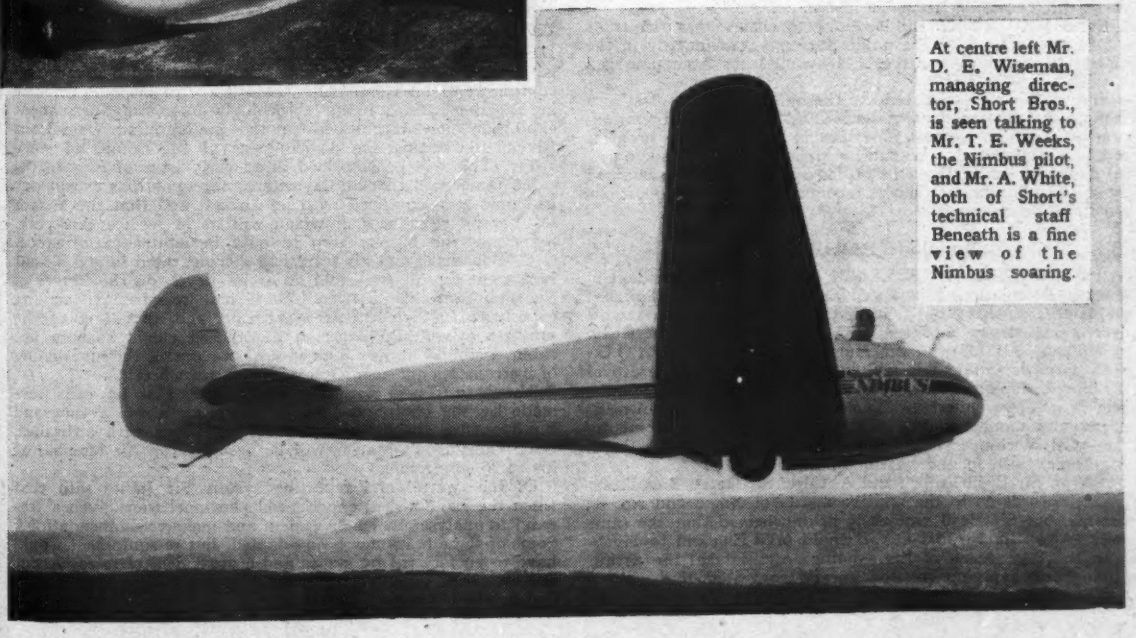
Gliding-in to land over the Rochester hangars the rear-seat occupant is doing a spot of photography in return.

Short Nimbus Sailplane

Exclusive "Flight" Air-to-Air Photographs

DESIGNED by members of the technical staff of Short Brothers, of Rochester, who had formed themselves into a gliding club, the Nimbus sailplane proved so successful that the company decided to embark on commercial production.

The sailplane is a tandem two-seater low gull-wing machine of extremely pleasing appearance and high degree of finish. The unique wing-root position—for a two-seat



At centre left Mr. D. E. Wiseman, managing director, Short Bros., is seen talking to Mr. T. E. Weeks, the Nimbus pilot, and Mr. A. White, both of Short's technical staff Beneath is a fine view of the Nimbus soaring.

SHORT NIMBUS SAILPLANE

glider—results in both occupants getting a truly magnificent field of view and, in this connection, the moulded Perspex canopy seems to offer negligible distortion.

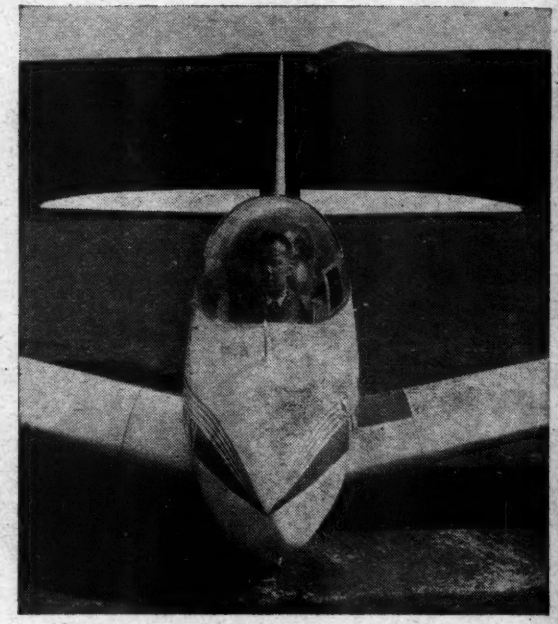
For a glider the cockpit is surprisingly roomy, and dual control is provided together with dual instrumentation, the latter comprising altimeter, vertical speed indicator and airspeed indicator. In addition to the primary flight controls (which are admirably light and responsive), spoilers are incorporated in the upper surface of the gull section and, in addition, the unusual feature of adjustment for aileron droop or upfloat is also provided.

The undercarriage consists of a faired nose skid, a centre landing wheel and a tail skid, the use of a wheel greatly aiding launching: as the wheel is provided with a mechanical brake actuated by a trigger on the front control column, landing, too, can be made in an extremely short distance.

We understand from Short Brothers that production of the Nimbus is due to start in June at the rate of one per week. The sale price is £750, and the delivery rate will depend upon the number of orders received and, therefore, the production line laid down.

SHORT NIMBUS DATA

Dimensions	
Wing Area	240 sq ft
Span	62ft
Overall Length	27ft 4in
Aspect Ratio	16
Empty Weight	800lb
Performance	
Sea-level conditions—2 crew, each weighing 200lb.	
Minimum Gliding Angle	1 in 25.8
Sinking Speed	2.3ft. sec at 38 m.p.h.
Recommended Approach Speed	42 m.p.h.
Stalling Speed	35 m.p.h.
Maximum Permissible Speed	130 m.p.h.



Although slim and clean, the cockpit is quite roomy and the canopy affords excellent field of view.

This new sailplane is a quite charming and extremely efficient aircraft and, furthermore, one which is admirably fitted for giving dual instruction to advanced cadets. In this connection, whilst the Nimbus was being demonstrated to us, representatives of R.A.F. Reserve Command were present with a view to inspecting the glider for the A.T.C.

SHIP-BOMBING TRIALS

IT became known over the Easter holidays that bombing trials against warships will be conducted during May about 2½ miles from the Horse and Dean Sands. Inert bombs will be used and the tests will be followed by controlled internal explosions within the target ships. There will also be trials of various types of guns against corvettes, L.C.T.s, minesweepers and ex-German E-boats. Like the bombing trials, these will be visible from the shore.

Everything possible will be done to ensure that the trials shall not conflict with the public interests, particularly in the matter of the fouling of beaches by oil leaks from damaged vessels.

The trials now announced are the outcome of the discovery early in the war that lack of detailed and methodical investigation of ship damage was a serious handicap to the progress of naval architecture. Wartime experience provided some useful data concerning the type of damage likely to be sustained by ships in action, but this is incomplete and many questions remain to be answered.

No. 83 GROUP DINES

AIR MARSHAL SIR WILLIAM F. DICKSON, President of the Association, announced at the second annual dinner on March 28th that No. 83 Group Officers' Association was now over 1,000 strong and that 350 were present. The Guest of Honour Air Marshal Sir Hugh W. L. Saunders, A.O.C.-in-C. Bomber Command, replying to the toast of the Royal Air Force, deplored the feeling of frustration from which the Service was now suffering. The effects of the shortage of manpower and money could, he thought, only be overcome by the spirit of co-operation between the members of the Royal Air Force, both in and out of uniform.

A.V-M. Sir Basil Embry and A. Cdre. Sir Harry Broadhurst crossed swords as to the relative merits of No. 2 and No. 83 Groups, but Sir Basil graciously acknowledged that the same spirit shown by No 83 in war would save England to-day.

In the last speech of the evening, Air Marshal Sir Arthur Coningham, replying for the guests, suggested that only a buccaneer of Al Capone's standard could inspire such a non-austerity evening. This, he thought, was brilliant, but understandable by those who knew No. 83 Group.

He looked forward, however, to even better things in three years from now—a ball in addition to the dinner, and beautifully dressed ladies to grace the occasion. A roar of approval went up when he made the suggestion that he would "love to have a 2nd T.A.F. reunion in Brussels."

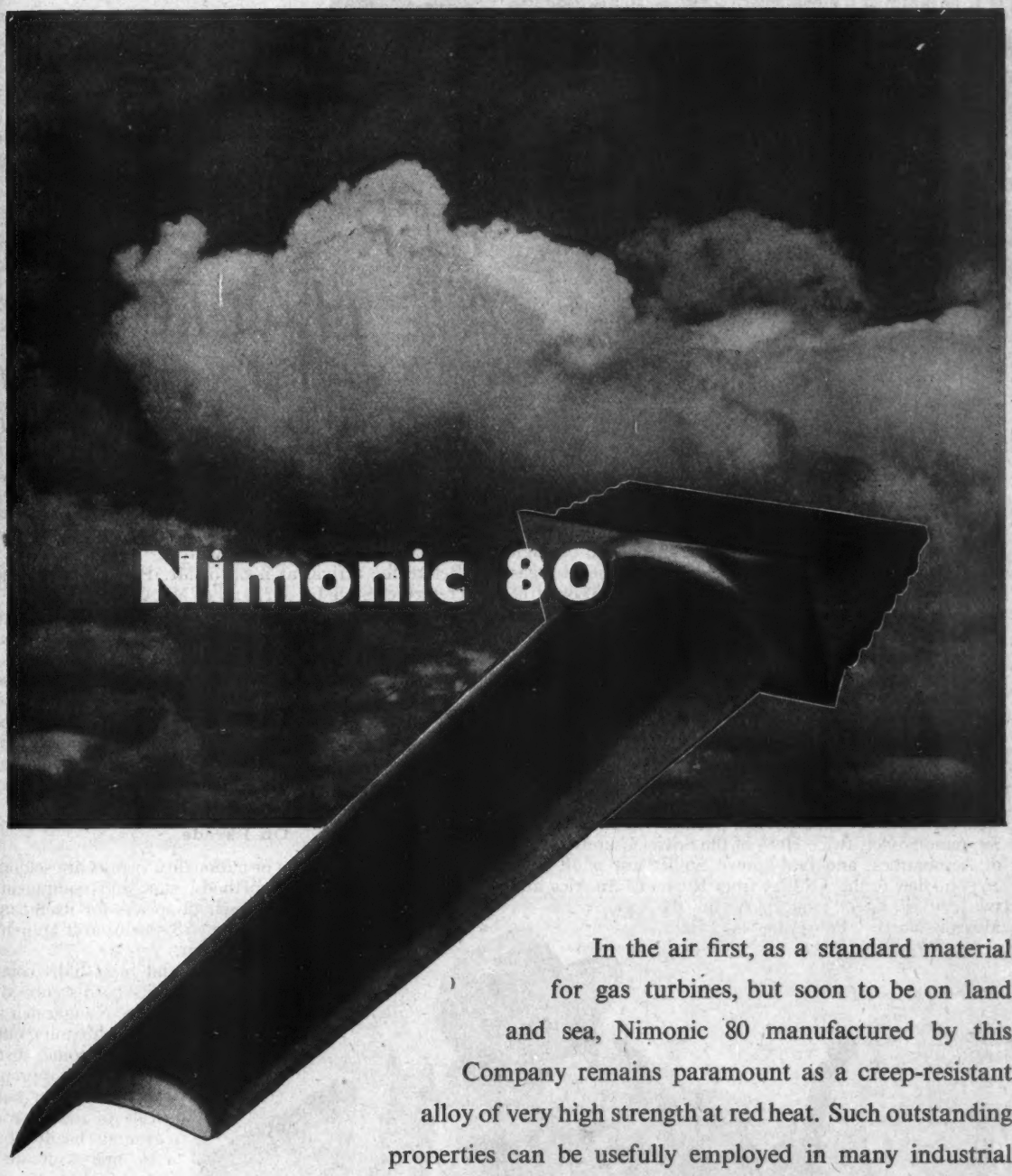
FIGHTER COMMAND TO-DAY

AT his historic and beautiful headquarters—Bentley Priory, Stanmore—Air Marshal Sir James M. Robb, K.B.E., C.B., D.S.O., D.F.C., A.F.C., A.O.C. in C. Fighter Command, lately gave some details concerning the reorganisation and re-equipment of his Command. Together with his Staff Officers he explained items in an absorbingly interesting permanent exhibition now established in the underground Operations Room, illustrating the development of the Command since 1925. This will be described in an early issue of *Flight*.

Sir James said that all day-interceptor squadrons except one had now been equipped with jet aircraft and that the Meteor IV, several squadrons of which will be in service this year, represents the biggest step to date in fighter performance. G/C. Donaldson and his team had demonstrated in 360 all-out runs what the Meteor could do at low level, on the fringes of the compressibility barrier, and it now remained to acquire experience at high altitudes (35,000ft and above) using the pressure cabin. Problems to be studied would concern the cabin, visibility at very high speeds, armament, the functioning of instruments and manœuvrability at great heights.

The C. in C. also disclosed that no fewer than ten runs were made by the High-Speed Flight at speeds above a thousand k.p.h. After the fitting of short-span wings with airbrakes, G/C. Donaldson's Meteor will be used by the Air Marshal as his personal aircraft.

Of the control and reporting system Sir James said that when the war finished experienced personnel were given a free hand to analyse the whole system and make recommendations. Some of these have now been adopted, but re-equipment would have to go forward by stages and a great deal of research was still required, especially in radar, where big increases in range and height limits were necessary.



In the air first, as a standard material for gas turbines, but soon to be on land and sea, Nimonic 80 manufactured by this Company remains paramount as a creep-resistant alloy of very high strength at red heat. Such outstanding properties can be usefully employed in many industrial applications wherever high temperatures and working stresses are involved. Write to us for further technical information.

★ "Nimonic 80" is a Registered Trade Mark and the alloy is the subject of patent applications.

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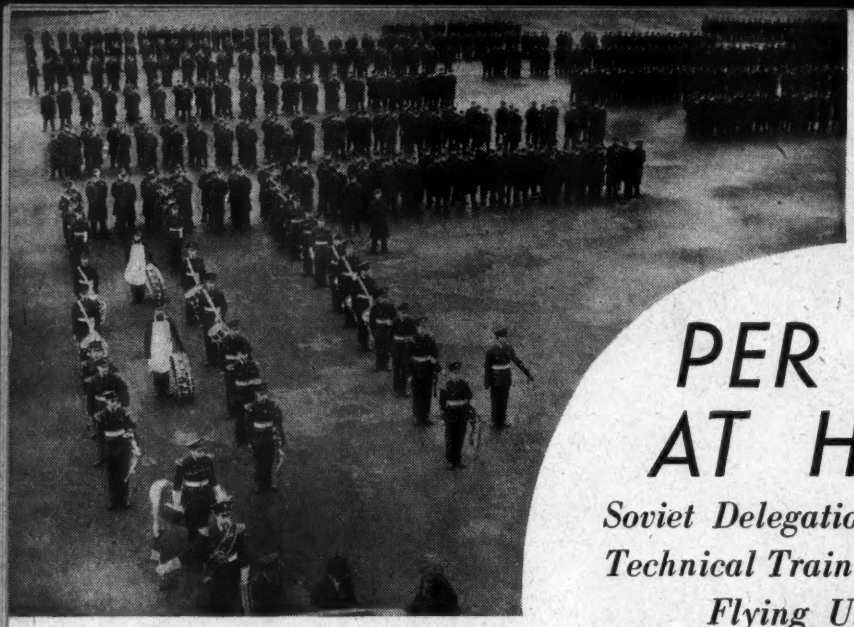


A section of the Halton parade ground with the pipe band (and, of course, "Flight Sergeant Lewis") in the forefront.

PER ARDUA AT HALTON

Soviet Delegation at No. 1 School of Technical Training: Jet and Helicopter Flying Under Difficulties

A CONVOY of Daimlers, headed by an R.A.F. staff car and motor cyclists, drove from London on March 27th in a clammy mist and glided through the gates of R.A.F. Station Halton. The delegation of twenty representatives of the Supreme Soviet of the Union of the Soviet Republics had arrived to inspect No. 1 School of Technical Training and to witness a display by aircraft of five Commands.

At Halton House—the officers' mess—the party was greeted by Air Marshal Sir Ralph S. Sorley, K.C.B., O.B.E., D.S.C., D.F.C., A.O.C.-in-C. Technical Training Command, and were acquainted with the aim and scope of the School by A. Cdre. J. F. Titmas, C.B.E., who commands the Station.

Representing the Red Army Air Force was Colonel-General Mikhail Mikhailovich Gromov, Member of the Supreme Soviet, twice Hero of the Soviet Union, Doctor of Aeronautics, and best-known Soviet test pilot. In 1935 he flew in the ANT-25 from Russia to America and two years later took part in the Moscow-North Pole-America flight. By 1941 he had been appointed Director of the Soviet aircraft-engine industry and towards the end of the war took command of the 1st Air Army.

Before the arrival at noon of Mr. P. J. Noel-Baker, Secretary of State for Air, and of Marshal of the R.A.F. Lord Tedder, Chief of the Air Staff, the delegates were conducted in two parties round the Technical Workshops and representative domestic buildings. It was hardly to be expected that the same interest in these institutions should be displayed by all the guests, for their number included an author, a poet, doctors, professors, a cotton worker and a locomotive engineer from Sumi Oblast; but none betrayed symptoms of boredom, and there were plentiful expressions of interest and appreciation.

On Parade

Irrespective of calling or nationality visitors are seldom unimpressed by Halton methods, staff and equipment. The record of the School speaks for itself; up to January, 1945, about 18,500 aircraft apprentices had been passed out.

Their tour of kitchens and mess halls completed (one of the latter, in its hard-scrubbed, tiled and stony severity, may have suggested a sort of superior abbatoir) our visitors watched some two thousand apprentices march in fine style to the parade ground, headed by the pipe, drum and fife band of No. 1 Wing and by a mixed military band. The twirling mace and the deportment of "Flight Sergeant Lewis," the goat mascot,

Colonel-General M. M. Gromov, twice Hero of the Soviet Union, finds the Vampire's cockpit a special source of interest.

Squadron Leader Cable, from Beaulieu, sits pretty in the Sikorsky Hoverfly. He gave an outstanding display.

evidently made a particular impression. It seemed a pity that this highly creditable parade should not have been formally reviewed.

A flying programme representative of all branches of the Service had been planned for the afternoon. Forty-eight aircraft (Sunderlands, Lancasters, Lincolns, Mosquitoes, Spitfires, Hornets, Meteors and Vampires) were to take part in a formation fly-past; a Lincoln was to fly at 2,000ft on 4, 3, 2 and finally one engine; a Vampire and Meteor IV were scheduled for aerobatics; Dakotas, Halifaxes and gliders were to demonstrate aspects of Transport Command work, and a helicopter would show its qualities. The weather, as might have been expected, ruled out the full demonstration but several dozen illustrious personalities attended at the airfield late in the afternoon to watch a curtailed programme.

Celebrities

It was impossible in the very short time that this was in progress to establish the identities of all the notabilities in the special enclosure, but in addition to the S. of S. and C.A.S. there were Air Chief Marshal Sir John Slessor and Air Marshals Sir Leslie Hollinghurst and Sir William F. Dickson, the A.O.C.-in-C.s of the Commands, and representatives of the Air Council, Air Ministry, Foreign Office and Soviet Embassy, various R.A.F. Groups, the Army, Navy and Royal Marines.

Lord Tedder sat with Col.-Gen. Gromov to watch a D.H. Vampire of 247 Squadron, Odiham, flown by F/O. "Nick" Carter, put up what must rank as one of the finest bad-weather jet displays to date. Severely restricted as he was by very low cloud—by which the Vampire was more than once obliterated—and cramped in his style by the hills which lie round Halton, F/O. Carter succeeded in bringing his aircraft over on several very low runs at near-500 m.p.h. speeds. Our visitors were obviously amazed by this performance and F/O. Carter deserves the highest praise for his major part in saving a very important audience from an afternoon of dismal disappointment.

The Vampire was brought in for an exemplary landing under appalling conditions and while the visitors were peering closely at its intriguing structure their interest was rewarded with a raging blast of paraffin fumes which sent European and Asiatic headgear skywards and momentarily prostrated the Secretary of State.

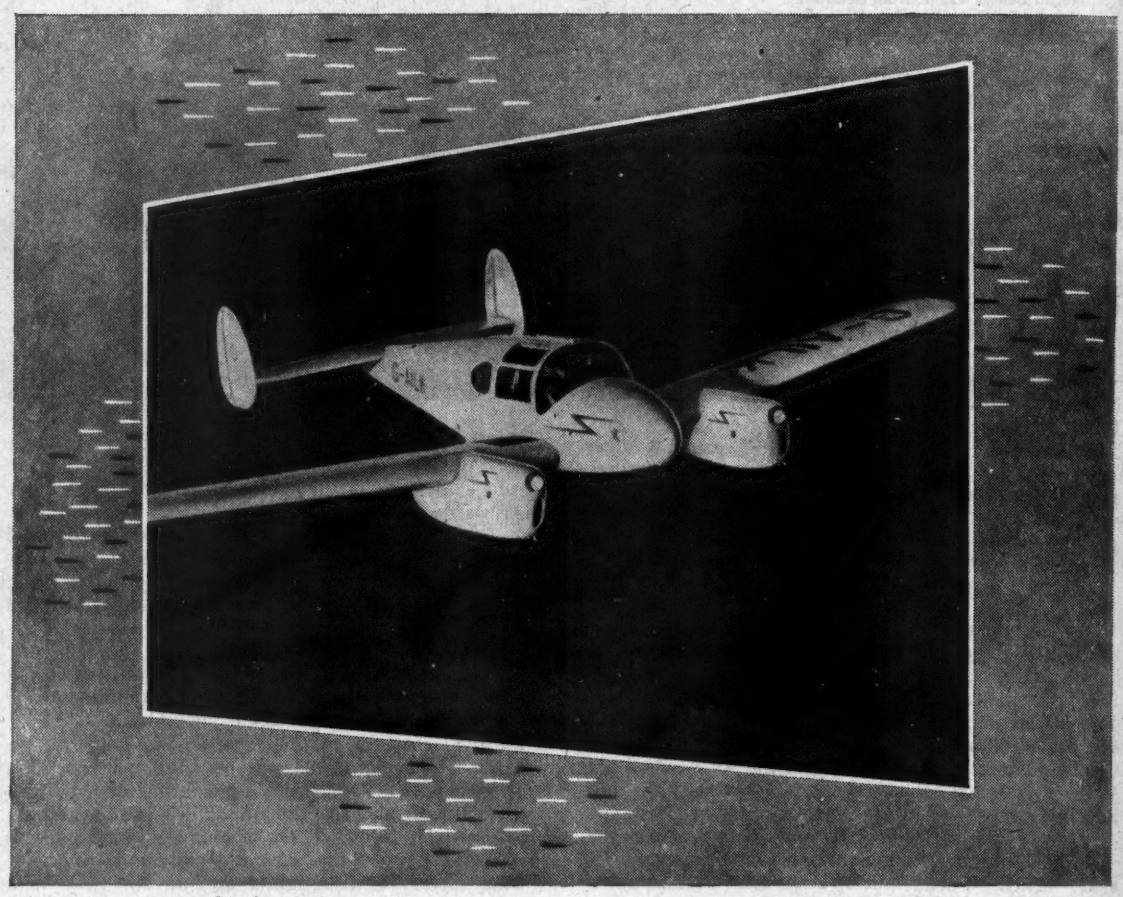
F/O. Carter was freely congratulated—on his flying at least!—and questioned. One Russian officer wanted to know if a Goblin I or Goblin II was installed in his aircraft.

A short-span Meteor IV flew circumspectly over but did not return—and little wonder, for conditions were suitable only for helicopters and such-like.

By great good fortune the Sikorsky Hoverfly (R4-B), scheduled to demonstrate, was on hand, and its pilot, S/L. Cable, of the Airborne Forces Experimental Unit, proved himself an exceptionally skilled—and entertaining—exponent of helicopter technique. In his hands the Sikorsky seemed the acme of docility and sensitivity.

Thus a very British fighter and an American helicopter designed by a Russian showed how the R.A.F. lives up to its motto.

M. Fadeev, General Secretary of the Union of Soviet Writers, with Mr. Noel-Baker and Lord Tedder.



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RADIAL REVIEW

A Stock-taking of the Newest Bristol Hercules and Centaurus Engines : Important Installations

MANY people who virtually lived with Bristol engines during the war now confess to profound ignorance of the various post-war marks of the Hercules and Centaurus and of their applications to new aircraft. The following outline, based on the latest information from Bristol, will bring them fully up to date and will add to their knowledge some facts concerning important new military and civil installations.

Hercules

At the Paris Show last November the Bristol Company announced the new Hercules 230 and 730 engines with a take-off power of 2,000 h.p.; the previous highest figure was 1,715 h.p. Associated with this useful increase in output was a strengthened "power section," including a new crankcase with bigger main bearings, new cylinders and an altogether new type of steel-topped, copper-based cylinder head to give greatly improved heat dissipation.

Comprising the new series are the military marks 230 and 231 and the civil marks 730-733. In every case the basic engine is the same and the different numbers denote variations of equipment. Numbers with odd last digits signify the inclusion of a torquemeter.

Up to the present the Bristol Company has not been permitted to name the military aircraft for which the 230 series was introduced and on the civil side there is as yet no firm programme, but the 730 series may be regarded as natural successors to the 630 range of which the 630 and 634 are used in the Viking, 632 and 638 in the Bristol Freighter and Wayfarer, and 637 in the Solent.

The Hercules types already named have single-speed superchargers but the recent announcement of the Hermes IV by Handley-Page led to the disclosure that this aircraft would use a two-speed-supercharged Hercules in the 2,000 h.p. class. This will be the Hercules 763 (or 762 if a torquemeter is not required). The precise rating is still subject to discussion and type test, but, as the engine is intended to be operated on 115/150 grade fuel, it may be expected that higher powers will be available than in the 730 series. An important characteristic will be the maintenance of full sea level take-off power up to the height of such airfields as Nairobi. The engines will be supplied as complete plants of extremely low drag. Corresponding military types, though of different rating, are the Hercules 260 and 261.

Mention must be made of the new Hercules-Tudor, the present prototype of which (a Tudor II airframe) is fitted with two Hercules 120 and two Hercules 121 engines in Bristol power plants. Here again, the only difference denoted by the mark numbers is the fitting of a torquemeter on the 121.

These engines, it must be pointed out, were put in hand at an early stage, before there was any question about the take-off power required by the Tudor, and the output is, therefore, 1,715 h.p. Even so, the makers "would not be surprised" if take off and climb and handling with one engine cut were found to be better than with the standard Tudor II. The lean mixture cruising consumption figures of only 0.42 lb/b.h.p./hr at 1,230 h.p. in low supercharge, and 0.47 lb/b.h.p./hr at 1,090 h.p. in high supercharge, should be of considerable benefit.

Although no official instructions to proceed further with the Tudor installation have been received at Bristol it should not be difficult to apply the Hercules 763, as for the Hermes IV.

Centaurus

The Hawker Sea Fury and Bristol Brigand are fitted with the latest military marks of Centaurus—the XVIII and 57 respectively. In each case the basic engine is the same, with two-speed supercharger, but the XVIII has a flexible mounting, interconnected throttle and airscrew controls and a 0.444 reduction gear ratio, whereas the 57 has a rigid mounting, separate controls and a 0.40 gear ratio. Moreover, the Sea Fury's engine is not equipped for methanol/water injection, and is limited to 2,500 h.p. for take-off, whereas the Brigand used the power boost system to allow a take-off output of 2,825 h.p.

The civil development of the Centaurus XVIII and 57 is the 630, as used in the Airspeed Ambassador. If a torquemeter is fitted the mark number becomes 631. A single-speed supercharger is fitted on the 630-631 and various detail refinements, including a full "dynamic suspension" engine mounting, improved Hobson-R.A.E. bulk-fuel injector with oil-heated throttles, stiffer power section and copper-based cylinder heads, are incorporated. A precise rating has not yet been decided upon but the Bristol Company are not out for more power than in the military Centaurus—at least not until the new fuels are in full supply.

Other applications of the new civil Centaurus are in the offing and a two-speed-supercharged version may eventually materialize.

ILIFFE EXHIBITION PLANS

THE withdrawal by the Council of the Trade and Technical Press of their intended joint exhibit from all sections of the British Industries Fair lends interest to the extensive plans for the B.I.F. which are announced by the Associated Iliffe Press, whose range of 31 technical, trade and specialized journals comprises the largest group of this type in the world.

Since many of the Iliffe journals are concerned with engineering in its various branches, the main display will be Stand D.216 at Castle Bromwich. Periodicals to be exhibited there include:—

Aircraft Production, The Architect & Building News, The Autocar, Automobile Engineer, British Engineering Export Journal, British Plastics, Bus & Coach, Electrical Review, Export Trader, Farmer & Stock-Breeder, Flight, Iron & Steel, Machine Shop Magazine, Mechanical Handling, Metal Industry, The Motor Cycle, Motor Cycle & Cycle Trader, Motor Trader, Motor Transport, Poultry World, Power Laundry, Welding, Wireless & Electrical Trader, Wireless Engineer and *Wireless World*.

Technical books and year books published by the house of Iliffes will also be displayed on this stand.

At Earls Court the Plastics Section is likely to be one of the chief centres of interest and here another Iliffe stand (No. 846) will show *British Plastics* and the *British Plastics Year Book*.

In a field rather different from the B.I.F., Iliffe journals and technical books are also to be shown at the 1947 Exhibition of the Physical Society, open at the Imperial Institute, London, from April 9th to April 12th. *Wireless World, Wireless Engineer, Electrical Review, British Plastics, Iron & Steel, Metal Industry* and *Welding* will be amongst the Iliffe publications exhibited.

FORTHCOMING EVENTS

April 10th.—G.A.P.A.N. Annual General Meeting at 5 p.m., Londonderry House, Park Lane, followed by annual dinner at 7 p.m., Connaught Rooms (York Room), Gt. Queen Street, W.C.2.
April 10th.—Royal Aeronautical Soc. "A Review of Production Difficulties in Relation to Aircraft Design." C. E. Fielding.
April 12th.—British Interplanetary Society: "Cosmic Rays," Lionel Gilbert, A.R.C.S., B.Sc., Science Museum, South Kensington.
April 15th.—R.Ae.S. Bristol. Annual General Meeting.
April 17th.—Royal Aeronautical Soc. "Testing Civil Aircraft," P. A. Hufton, M.Sc.
April 18 to 21st.—Aero Club of Spain. Madrid Air Rally.
April 24th.—Royal Aeronautical Soc.: "The Risk of Fire, and Fire Prevention Methods." Dr. J. W. Drinkwater B.Sc., D. Phil., and W. G. Glendening.
May 3rd.—Yorkshire Aeroplane Club: Flying meeting, Sherburn-in-Elmet.

Radio Equipment in the Solents

Comfort and Convenience in Operator's Compartment : Full Range of Aids to Navigation

By BASIL R. CLARKE, A.M.Brit.I.R.E.

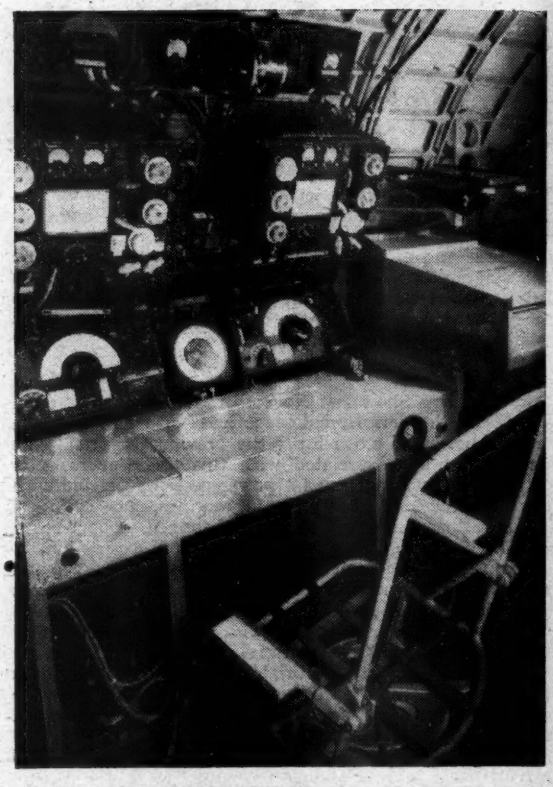
SHORT BROTHERS recently allowed me the privilege of seeing some of the twelve Solent flying-boats at present under construction at Rochester and the radio equipment in *Scarborough*, the second to be launched and now undergoing its flying trials. These aircraft are not absolutely complete when delivered to B.O.A.C. at Hythe so far as seating and internal decoration are concerned, but instruments and radio equipment are all fitted on the Medway.

Although the object of this article is to give a brief description of the radio apparatus being installed in the Solents, I should be less than human if I did not refer to the astonishment I experienced when I went on board and found myself ascending a genuine staircase to the upper deck. There is no doubt that this homely feature has a strong psychological effect on the passenger who is accustomed to the "tunnel" effect of our faster landplanes.

Accessible Equipment

The radio compartment is situated on the port side of the flight deck, immediately aft of the navigator's position. The operator has a full-size desk of the conventional knee-hole pattern, the top of which measures 3ft 7in by 1ft 3in, and is fixed at a comfortable height of 2ft 8in above deck level. The individual pieces of equipment are mounted on the sloping wall of the cabin above the desk, in positions within easy reach of the operator; a very important matter. The knee-hole, which is 1ft 9in wide, provides accommodation for the winch of the standard Marconi trailing aerial, and allows comfortable room for the operator to move his legs. Power units for some of the gear are housed in the spaces on each side of the knee-hole.

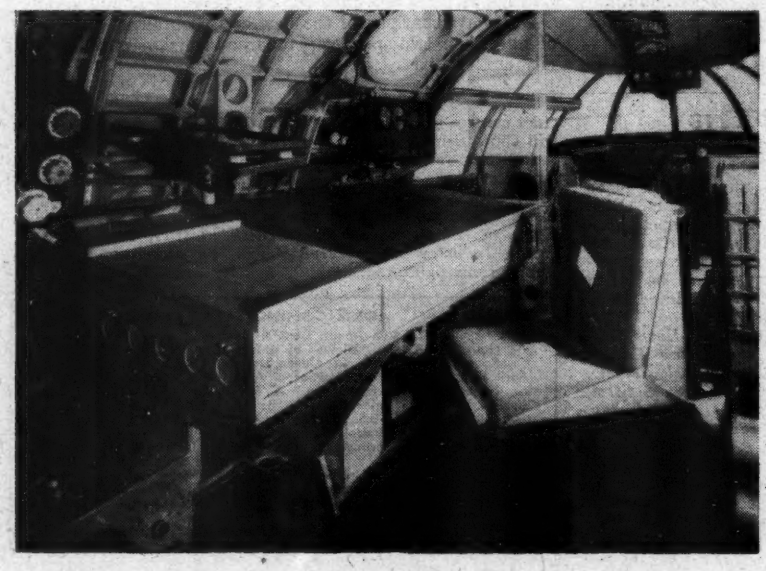
The equipment consists of M.F., H.F., V.H.F., D.F., a Radio Altimeter, an Intercommunication system and A.S.V. Radar.



RADIO OPERATOR'S POSITION : The AD 87B/8882B in duplicate and the Marconator are conveniently placed, and ample writing room is available.

The well-known general-purpose transmitter and receiver T1154 and R1155 are fitted in duplicate above the desk, but have been slightly modified to bring them into line with B.O.A.C. requirements, and are now known as the AD 87B/8882B. The transmitter covers the whole band of frequencies from 16.7 Mc/s to 200 Kc/s in four steps, and the receiver from 18.5 Mc/s to 75 Kc/s in five steps. The range of the transmitter for air-to-ground telephony, using the trailing aerial, is 200-250 miles, and for C.W. telegraphy it is 300-400 miles; the ranges are reduced to about one-third when using the fixed aerial. D.F. facilities are available in the 3 M.F. ranges of the receiver, and additional D.F. and homing are provided by the Marconator Radio Compass. The H.F. section is further covered by the T.R.1196, a combined transmitter-receiver with four "spot-frequencies," crystal controlled, in the 3 to 7 Mc band. This equipment is remotely controlled and, consequently, directly available to the pilot.

V.H.F. requirements are met by the provision of the 1143A combined transmitter and receiver, also known



THE CHART ROOM : The navigator, who is immediately forward of the radio operator, has plenty of room. Finishing touches are to be applied by B.O.A.C.

by its American store number SCR 522, which provides four spot-frequencies in the range between 100 and 200 Mc/s, and the 1464, also with four spot-frequencies in the band 100 to 120 Mc/s. The main difference is that, whereas 1143A weighs about 120 lb, the 1464 weighs only 35 lb.

Intercommunication is provided by the wartime 1134A equipment with a power unit, No. 178, replacing the old dry battery arrangement.

It was originally intended to fit Rebecca-Eureka for radar homing, but it has now been decided to provide A.S.V. Mk.11, which is too well known to require description.

One of the most interesting fittings is the American AYF radio altimeter. The apparatus employs "frequency-modulation," which means that the carrier frequency is continuously varied at a known rate. The height of the aircraft above the ground is determined by measurement of the difference between the frequency of the "echo" coming back from the ground and that of the transmitter at the moment the "echo" returns. This gives the time interval between departure and arrival of the signal, and therefore the distance it has travelled. The result is shown as a direct height reading. The meter can be read in two ranges at will, from 50-4,000ft and 50-400ft. It is to be regretted that no British Radio Altimeter is yet available, this apparatus being manufactured by the Radio Corporation of America.

The aerial systems are quite normal and include trailing and fixed aerials, D.F. loop, V.H.F., Radar Scanner and the Altimeter system. The total weight of the installation is considerable, and with desks, etc., is of the order of 700 lb, but this should not be regarded as excessive in view of the duplication of equipment with the resultant safety factor. Owing to the fact that certain apparatus originally designed for use in R.A.F. aircraft is included, it has not been possible to employ the new rack-mounting arrangements now agreed on for airborne use.

Dual at 585 m.p.h.

Meteor Trainer Details : Mark IV Fighter Demonstration

THE bare announcement that a dual-control trainer version of the Gloster Meteor had been developed was made in *Flight* last week. Using basically the same airframe as the Mk. IV fighter the Trainer has a slightly longer fuselage, permitting the pilot and pupil to be seated in tandem beneath a single continuous enclosure. Positioning of both cockpits forward of the leading edge, as on the fighter, allows excellent all-round view.

Stress analysis shows an ultimate load factor of 9g at all speeds up to 600 m.p.h., in conjunction with a Mach number of .82.

All controls and necessary instruments are duplicated and provision is made for a 180-gallon ventral drop tank, but no armament or other military equipment is carried.

Coinciding with the announcement of this new version of the Meteor comes news of a demonstration tour by a Meteor IV, arranged by the Gloster Aircraft Co., Ltd., and Rolls-Royce, Ltd. This will include airfields in Belgium, Holland, Denmark, Sweden and Norway, and will start on April 14th. The complete *equipage* will include a civil-registered, vermilion-coloured Meteor IV with twin Derwent V power plants, a specially fitted servicing lorry with driver and ground crew, and a D.H. Rapide.

"Flight" photograph.

Eric Greenwood (left) and S/L. D.B. Cotes-Preedy who will tour Scandinavia with the Meteor IV.

Squadron Leader "Digger" Cotes-Preedy, D.F.C., G.M., will demonstrate the Meteor, and Mr. Eric Greenwood, O.B.E., will be in charge of the business side. Also on hand will be Squadron Leader Harker, a Rolls-Royce test pilot, who will be responsible for power plant matters, and a number of Gloster and Rolls-Royce service engineers.

Facilities for the starting and refuelling of jet aircraft are not always available, even on the most up-to-date airfields, and provision is made in the servicing lorry for a "Streamline" filter and for a new type of high-output generator and ground starter unit. External connections from internally carried oxygen and compressed air cylinders will provide facilities for maintaining the Meteor's oxygen system, and for servicing the pneumatic shock absorbers.

The Meteor should give its first demonstration on April 15th or 16th at Valkenburg airfield, The Hague. Subsequently its itinerary will be: April 18th-20th Moelsbruk (Brussels, Belgium); April 21st Karup (Jutland, Denmark); April 23rd-24th Kastrup (Copenhagen, Denmark); April 26th-29th Bromma (Stockholm, Sweden); May 1st-5th Fornebu (Oslo, Norway).

GLOSTER METEOR TRAINER

Two Rolls-Royce Derwent V Turbine Jets.

Dimensions

Span	37ft 2in
Length	43ft 6in
Height	13ft

Weights

Weight Empty	10,290 lb
Removable equipment, crew, fuel and oil	3,248 lb
Ballast	462 lb
All-up weight	14,000 lb

Tankage

Fuselage	325 gal
Ventral drop tank	180 gal

Performance

	Max level speed (m.p.h.)	Max cruising speed (m.p.h.)
Sea level	585	540
10,000ft	585	550
20,000ft	570	550
30,000ft	540	530
40,000ft	490	470

	Rate of climb (ft/min)	Time of climb (min)
Sea level	8,170	0
10,000ft	6,700	1.4
25,000ft	5,200	3.1
30,000ft	3,650	5.4
40,000ft	2,050	8.9

Take-off ground run	1,400ft
Landing ground run	1,870ft
Endurance at 30,000ft (325 gal)	1.4 hr

American Newsletter

Politics and Payment : Wild Press Statements : New Types from the West Coast : G-suits for Air Battles

By "KIBITZER"

THE troubled history of civil aviation in 1947 seems to be on almost identical lines in Great Britain, China, Northern Europe and the United States. A sequence of fatal accidents, caused by faulty maintenance, human error, or failure of mechanical ground aids, has been followed by public enquiries at which the safety of aviation has been the defendant. It is too early yet to say what the recommendations and final outcome of the United States hearings will be, but they should serve to highlight the fact—stressed more than once in these columns and Editorials—that the airlines everywhere went into these winter months quite unprepared to tackle the problems that resulted from their bigger and faster aircraft and their increased and faster schedules. In England there seems to have been a tendency on the part of the daily Press (always likely to be somewhat unreliable in aviation matters) to blame one particular aircraft, but here in the States the responsibility is more widely spread.

Unfortunately, Congressional enquiries are, more often than not, intimately connected with political advancement, and it is possible that this present one is no exception. If, however, it results in Congress voting more money for the installation of safety aids throughout the country much good will have been done, for much as the airlines want such improvements they simply haven't got the money to pay for them themselves. Nor for that matter has the Civil Aeronautics Administration. The chief requirement is the immediate installation of Ground Approach and Instrument Landing Systems, together with the re-design of the lighting of many of the airport approach lanes, and the introduction of F.I.D.O.

As far as the airline pilots are concerned, they not only want the aids listed above but are anxious to improve the accident investigation (at present carried out by the Civil Aeronautics Administration) and are suggesting an independent organization for such a purpose. They also want the question of pilot fatigue to be re-examined, and possible fire hazards to be further eliminated. In both these latter demands there is considerable justification. Too few people realize the tremendous strain imposed on a pilot during long periods of bad-weather flying and during instrument let-downs and landings. And, as has been pointed out in these columns before, the risk of fire in the air is still far too great. Unfortunately, it is a subject which is still receiving scant attention from aircraft designers, engine builders, operators or those responsible for the safe operation of the world's airlines.

ACCIDENT REPORTS

MENTION has been made of the unreliable reporting of aircraft accidents by the daily Press, and although the responsibility for such reports must basically rest with the newspapers concerned, the aircraft industry and operators in both this country and in England are not without blame. There has always been a tendency for firms to close up like oysters directly one of their products is involved in an accident, with the result that the reporters on the job—having failed to get help from those most likely to be able to give it—make up the story from what little they know—or don't know. Results of such imaginative writing are very, very bad for aviation. Surely it is better to say to the Press: "We don't know the whole story yet—but these are the facts to date and we will let you know more directly we know it ourselves"? In such a case the first report of an accident should, at the worst, bear some relation to the truth and to the subsequent findings. This is seldom the case at present. However distasteful it may be for a manufacturer to admit a fault in his design, or for an operating company a failure of inspection, such a scheme will at least minimize the vast harm that often results from the present-day reporting.

In connection with these wild Press statements, it should be put on record that the pillorying of the Dakota by the English daily papers during the rush of crashes in mid-January was received with pretty sour looks in America. And not without reason. For here was an aircraft of proved integrity, which had operated, and was still operating, in vast numbers the world over, and which was known to be safe and reliable, suddenly accused of being a wanton, a killer, and a death trap. And, as far as could be seen over here, all because it was being poorly operated or badly maintained, generally by people who should know better. The all-up weight that is permitted on some of the European airlines also came in for criticism, and American pilots certainly would not fly a D.C.3 at the loadings which are said to be normal on some foreign operations.

FLIGHT RULES FOR HELICOPTERS

THE time is coming when we shall have to consider the safety regulations for rotary-wing aircraft. Flight rules that apply to fixed-wing machines bear absolutely no relation to those that should be drawn up for the control of helicopter flying. Unfortunately the existing regulations may tend to carry on and be used as the basis for the new ones. If this is allowed to happen, rotary-wing flying will start off at a disadvantage, from which it may never recover. This has been realized by certain sections of the American aircraft industry who are considering what steps should be taken to safeguard helicopter operators and private owners. The writer feels, however, that this is something which should be considered on a world-wide basis and suggests that it is a matter which could best be dealt with as a whole by P.I.C.A.O. and not piecemeal by individual countries.

SOME PROMISING TYPES

THE more one looks at the specification of the Douglas Cloudster the more interesting it becomes. If the flight tests now due prove successful, this may be one of the most outstanding aircraft of 1948. It is not always fair, or kind, to make comparisons with existing types, but this new machine does stack up very favourably with some of the most popular twin-engined executive transports at present in production. A range of 950 miles at 200 miles per hour with five people and 250 pounds of baggage is not to be sneezed at, and the single-engine performance is equally good. This is definitely a type to watch.

The West Coast manufacturers have one or two other new types, either in the air or just about to fly. The Northrop Pioneer is said to be flying successfully, and looks better and more attractive than the mock-up indicated. So far the company has not stated whether it will go into production, but seems to be waiting for the results of the flight tests and for the reaction of the buying public. It is probable that a limited number will be built, however.

Boeing also have released details of their new Army liaison L-15A, and photographs have appeared in the Press. This is not a pretty aircraft but may prove to be a practical one. It has a boot-shaped gondola, slung beneath the wing and made almost entirely of Plexiglass. The tailplane, which has "inverted" rudders, is carried on the end of

AMERICAN NEWSLETTER

a single tail boom. The engine is mounted in the toe of the boot, and drives a normal tractor airscrew. The all-up weight is just over 2,000 lb, and it has a speed range of from 50 m.p.h. to 112 m.p.h., a service ceiling of 16,400 feet, and a normal endurance of 2½ hours.

The North American XB-45 four-engine jet attack bomber is still said to be held up for lack of engines. The Consolidated XB-46, however (which is believed to be to the same specification) is likely to fly before May. This latter is one of the most attractive machines yet built and certainly looks as though it should be fast. Photographs indicate that Consolidated have stuck to the Davis wing for this project, but the very sleek lines of the machine give the impression that it is smaller than it really is. What sort of flaps and ailerons are fitted is not known, but the former may be of the full-span variety.

MACH NUMBERS AND "G"-SUITS

SOME remarks in these columns regarding the accelerations imposed on the P.80 under Service conditions have caused a certain amount of discussion in various quarters. It has been reported that acceleration of 8 or 9G are normal for this machine and that these are obtainable because the P.80 pilots wear "G"-suits as a matter of course on all flights. If such suits are standard equipment in the U.S.A.A.F. jet fighter squadrons, these figures are feasible but it does suggest that this particular machine must be designed for an ultimate factor somewhat higher than that required of British fighters. In other words the manufacturers, realizing that pilots will always go the limit in such matters, must feel that the P.80 will stand loadings of, perhaps, as high as 12 G without danger of structural failure.

The chief argument against the G-suit when it was first introduced was that it would enable pilots to withstand such high accelerations that they would be pulling the wings off before blacking out—an argument that can only be dismissed if the load factors, and high-speed stall and control characteristics of the aircraft, are satisfactory. If this report on the use of G-suits is correct, it would mean that, although the Meteor—and possibly the Vampire—may be faster than the P.80 on the level, they could be outturned if it came to a dog-fight.

Another consideration is the behaviour of the modern jet fighters—British or American—under these high accelerations and at really high speeds. As a rule it is safe to say that an aircraft with a low critical Mach number will show up badly when the loading is artificially increased by violent manoeuvres, even though the speed at which the manoeuvre is carried out may be some way below the critical compressibility speed of the machine. On the other hand, an aircraft with a higher critical Mach number may be correspondingly better behaved under such conditions. Even at low G a really high-speed stall is a pretty uncomfortable performance, but if turns or pull-outs are made possible at the speed and accelerations suggested for the P.80, then any resultant loss of control should be spectacular!

A GOOD FILM

INCIDENTALLY, and although it has little or nothing to do with this newsletter, American cinema audiences are getting quite a kick out of an opening scene in the excellent M.G.M. film "The Best Years of Our Lives." An Army Air Corps Captain, who is trying to get on to a flight to his home town on his return from overseas, is told by the girl booking clerk, with that sweet finality that we all got to know so well: "Oh! no, that flight has been cancelled." If the audience reaction should make the airlines blush, the film itself should restore faith not only in human nature but in the Hollywood movie industry. This is a film to see, and, having seen, to remember. For it shows what the ordinary, everyday, honest, small-town American really is, not what the majority of the super-duper Hollywood horrors generally make him out to be. And it has a little flying, some excellent humour, and much human understanding in it as well. (The film is now showing in London.—ED.)

WEDDING OF W/C M. A. SMITH

OUR assistant editor, W/C. M. A. Smith, D.F.C. and Bar, was married on March 26th at St. Giles Church, Ashtead, to Vivienne Margaret Nugent-James, youngest daughter of Mrs. Nugent-James, of "Whitehayes," The Marld, Ashtead. The reception, which was held at the R.A.C. Country Club, Woodcote, was attended by a very large gathering.

INTAVA TO END ACTIVITIES

IT is announced that Standard Oil Company (New Jersey) and Socony-Vacuum Oil Company Inc. will terminate by the end of 1948, the agreement under which these two companies have jointly provided aviation products and services throughout the world outside the United States.

Under these plans, which will not affect existing contracts or services, the activities of Intava Inc., the jointly-owned management and service affiliate of the two oil companies, will be terminated over approximately a two-year period. During this time, facilities and services will be absorbed by marketing affiliates of either business independently. In announcing the decision to discontinue the joint aviation marketing agreement, which has been in existence since 1936, Mr. W. W. White, president of Intava, emphasized that there would be no interruption of the service now being provided for airlines and private fliers throughout the world. At the conclusion of the period, Standard Oil Company (New Jersey) and Socony-Vacuum Oil Company Inc., expect to be in a position to provide independently aviation products and services.

Intava Inc. is the successor to International Aviation Associates, which was organized in 1936 by the present parent companies to co-ordinate supply of aviation oil products and services on a world-wide basis (except in the United States) which at that time neither company was able to furnish independently. Through Intava the two companies have developed and have been able to supply to any international air lines under a single contract standardized aviation products and services.

THE WAR IN THE ETHER

THE perfect title—that used above—was selected by A.V-M. E. B. Addison, C.B., C.B.E., for his paper on radio counter-measures, delivered by the Institution of Civil Engineers on March 27th.

There could be little doubt that the use of radio counter-measures, introduced for the first time with such telling effect in the war, would be a prominent feature in all future large-scale conflicts between nations, particularly in air warfare. Now that radio had assumed so important a role in warlike operations and was likely to play an even greater part as war became more scientific, it was only to be expected that one side would do all within its power to deny to its opponents the benefits to be derived from the use of radio.

Thus the Services were confronted with two new problems. First, they must assure that any radio device they use to further their war aims must be as impervious as possible to enemy interference; and, secondly, they must continue to develop, and have ready for use in the event of emergency, methods of countering any radio device which might be used by the enemy.

The term "radio" was used in its widest sense to embrace all forms of transmission of electric power through the ether and so included radar as well as all methods of wireless signalling.

It would be apparent that now radio had assumed so important a place in modern warfare, it was likely to play an even greater role when we arrive at the stage of fighting with remotely controlled projectiles capable of carrying tremendously powerful explosives and of being aimed accurately at targets over vast ranges. It might well be that some form of radio counter-measure would be the most effective means of defence against such weapons.

In the meantime the last war had shown us the writing on the wall—that a nation possessing the ability to exploit the valuable uses to which radio as a weapon could now be put would be endowed with advantages which an opposing nation could only hope to neutralize by a vigorous and carefully planned radio counter-measure organization.

CIVIL AVIATION NEWS

New Appointments in British Aviation : More Met. Stations : American Atlantic Schedules

NUMBER ONE : *Portsmouth*, **the first of nine Plymouth type flying-boats to be delivered to B.O.A.C., undergoing development flights at Hythe. This class is expected to be operating new services in May to India via Bahrein.**

"NEGLECT NO MEANS"

PERHAPS it is the simplicity of operation and the absence of advanced scientific equipment which make Fido such an attractive proposition to some of those who debate civil aviation in Parliament. Earl Howe asked the Minister of Civil Aviation last week which system the Ministry favoured at the present time, and which system it was their intention to develop in order to assist the landing of aircraft in bad visibility. He was also anxious to know what developments were taking place in scientific aids to navigation. Special reference was made, however, to Fido, and the Earl asked for the relative merits of the Fido system compared with other methods. Lord Cherwell championed Fido and stated that he had been trying for many years to persuade the authorities that the simplest way of dealing with bad visibility on airfields was to clear the fog from the runway.

Lord Cherwell considered that it was wrong to object to making an extra charge of 2 per cent or even 5 per cent on aircraft fares to ensure that the service would be safe and regular. It was, perhaps, unfortunate that the attention of the House was not drawn to the inherent dangers of this system so often referred to in this journal.

Lord Nathan, in reply, stated that he had an open mind but a perfectly friendly one towards Fido. Although he agreed with the arguments adduced by Lord Cherwell, he said that Fido could not be considered in isolation but would have to be considered in relation to radio navigational aids for runway approaches and also with airport lighting. Investigations would proceed and as soon as the mission which was now investigating American methods had returned and reported, Lord Nathan would be in a better position to make a definite statement.

Referring to other aids to safety, Lord Nathan said that the motto of his Ministry was the Cromwellian maxim "Neglect no means," and he went on to give details of aids which were already available. I.L.S. or SCS.51 was available at two civil airfields in the U.K. There were at present, he said, eleven civil airfields equipped with S.B.A., and soon that number would be increased to forty. B.A.B.S. was installed on five airfields and two more were being brought into operation. G.C.A. had been installed at London Airport and was being operated by an R.A.F. crew. One civil crew was in training and other crews would have completed training by October. The development of runway and approach intensive lighting systems were being actively pursued and real progress was being made. Throughout the U.K. there was an M/F. D/F service provided by seventeen ground stations grouped in chains of three or more, several of which provided services on two radio channels. There were also short-range D/F. stations used for homing and air traffic control at twenty-four U.K. airfields. There would eventually be more than fifty.

There were eight M/F. beacons and an additional twenty-nine were to be installed. There were six Eureka beacons installed at airfields and four more were to be added. At Prestwick, Northolt and Bovingdon there were radio ranges, and others were contemplated at Valley, Dorking, and possibly St. Morgan. Three Gee chains were in operation, covering England and Wales, and this was being extended to cover Scotland. Assistance was being offered to extend Gee to cover Europe. There were other systems for long-range navigation already installed, including Loran and Consol. The U.K. would increase the number of high-powered ground radio beacons on the Empire routes and would operate one of the Loran stations for the North Atlantic. There was a Consol beacon in operation in Northern Ireland and it was possible that others would be installed in British territory for the Atlantic route.

Lord Nathan announced that it was the intention to set up a highly qualified scientific committee to establish long-term plans for the development of radio. In addition he was proposing to appoint a chief scientific adviser but whose name he could not give until the appointment was confirmed.

BRITISH AIRWAYS' RESHUFFLE

SIR HAROLD HARTLEY will leave British European Airways to become chairman of B.O.A.C. upon the resignation of Lord Knollys at the end of June. With Sir Harold will go Mr. Whitney Straight, his vice-chairman in B.E.A., to be managing director or chief executive in the largest Corporation. In December, 1945, Sir Harold Hartley left the L.M.S. to join the board of B.O.A.C. and become, eventually, chairman of B.E.A. on August 1st, 1946. He has been connected with aviation for many years, being chairman of Railway Air Services from 1934-1945, and chairman of various other railway associated air companies until the time he joined B.O.A.C. From 1940-1945 he was chairman of the Associated Airways Joint Committee. Mr. Whitney Straight has been actively interested in civil aviation since before the war. He is now chairman of the National Air Safety Committee and the British Air Services Association, vice-chairman of the Aerodrome Owners' Association and a director of International Aeradio.

Mr. Gerard d'Erlanger will be the new chairman of B.E.A. He has been managing director of the Corporation and a member of the board since August 1st last year, and a member of B.O.A.C. since 1940. He will be remembered as the commanding officer of the A.T.A. from 1939-1945. The post of managing director of B.E.A. is to be filled by Mr. J. V. Wood, who leaves his present position as manager of the Eastern Division of B.O.A.C.

Capt. Loraine.

The Ministry of Civil Aviation have announced the appointment of Mr. E. A. Armstrong to be Under-Secretary in charge of the Establishment, Secretariat and Parliamentary, and Legal Divisions of the Ministry.

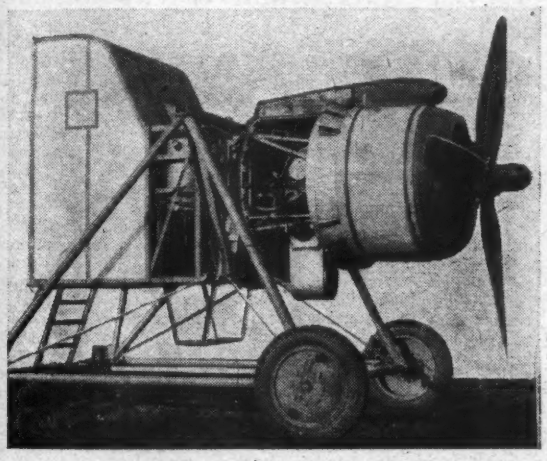
Other changes in the Corporation include Capt. M. Sorsbie, who is relinquishing his appointment as manager of the Middle East area of B.O.A.C. on becom-

ing general manager of East African Airways, an associate enterprise of B.O.A.C. He joined Imperial Airways in 1935 and flew as a pilot on the Empire routes and on surveys of West Africa. In 1940 he was made B.O.A.C. manager in West Africa and was responsible for wartime communications in that area. He was closely connected with services to the Western Desert during the campaigns, and to Malta when the island was under enemy attack, for which he was made an O.B.E. Subsequently he became manager of the Return Ferry service between the U.K. and Montreal.

Mr. R. M. Hilary has been appointed to take over from Capt. Sorsbie in the Middle East area. He, too, joined Imperial Airways in 1935, flew on the Empire routes, and took part in the survey and preparation of the routes later flown by the "C" class flying-boats.

Capt. A. C. Loraine has been made the Line Operations Superintendent for No. 3 Line, the Atlantic Division. Until recently he was a Constellation Captain on the transatlantic route, and has flown more than 13,000 hours, of which half have been on flying-boats. During the last war Capt. Loraine was co-pilot on three of Mr. Churchill's journeys, and in 1940 he was in command of the flying-boat "Clyde," which carried emissaries of General de Gaulle to French Equatorial Africa. His flying career began with air taxi work in 1931, but the following year he joined Imperial Airways and was promoted Captain in 1935. In addition to the normal pilot's licences, Capt. Loraine holds a first-class navigator's licence and ground engineer's licence. He also holds the Royal Society of Arts diploma in advanced economic geography, is a fellow of the Royal Geographical Society, and an associate of the Royal Aeronautical Society. He holds a master pilot's certificate for both flying-boats and land-planes.

Mr. Robert R. Wieland has resigned his position as traffic superintendent of the English Division of B.E.A.C. to take up the appointment of commercial manager in Central African Airways. The name of the new traffic superintendent has not yet been announced. Mr. R. J. Sullivan is taking up an appointment in the Communications Division of P.I.C.A.O. early in May, and is, consequently, resigning his post as superintendent of signals of the African and Middle East Division of B.O.A.C. Mr. W. Bell, who is to be the new superintendent of that division, has been B.O.A.C. radio superintendent at Durban.



POWER-EGG TEST HOUSE : A quickly detachable tow bar is provided and a ground anchorage plate is incorporated in the frame. The equipment weighs 33 cwt.

MOBILE TESTING HOUSE

IN an article entitled "Background to Maintenance" which appeared in *Flight* of December 5th, mention was made of a mobile engine test house which was being developed at the B.O.A.C. Experimental Factory. The prototype has been designed for testing the Hercules 100, but with only slight modification to the design it should be possible to make rapid ground checks under running conditions of other power units.

The test house provides means for making functional tests both for complete engines and components, and is an excellent aid to detecting pipeline leakages. After an engine has been run on the rig it may be offered up to its nacelle with absolute confidence and the knowledge that it has been thoroughly tested, not only with a gratifying cut in the grounded time of the aircraft, but also the complete elimination of the need for air testing.

The structure consists of a light tubular main frame on a rectangular base and triangular sides mounted upon four wheels. Bridging the triangle apices is a rigidly braced framework with four lugs for the engine mounting attachment. At the rear the main frame supports a fireproof and sound-insulated cabin, in which are three Perspex windows, fitted for observation purposes. Inside the cab is a writing table, a shockproof instrument panel (which is hinged to allow easy access to the instruments), an engine control box, fuel cock controls, a calibrated tank for hydraulic pump tests, variable resistances for generator tests, accumulators, voltage regulators, cut-outs, a fuse panel and other necessary pieces of equipment. All electrical cables are carried in metal conduits. Mounted in the bay formed by the junction of the cabin walls with the engine attachment structure are those units which are necessary for the functional tests and which include the engine lubricating oil tank, the Graviner fire extinguisher bottles, hydraulic oil tank and large capacity filter. The water-cooled cooler coil and oil reservoir for autopilot testing, and the air-cooler coil for the vacuum test and the boost trap are also housed in the bay. All pipes and cables are clearly tagged at their ends, and provision is made for making adjustments to the engine during the test run.

AIR TRAVEL AND EXPORTS

ADDRESSING the Liverpool branch of the Institute of Export on March 26th, Mr. F. N. Hillier, publicity controller of B.O.A.C., drew attention very forcefully to the advantages of using air transport for promoting overseas trade. He concerned himself mainly with making suggestions which might be of interest at this time, when goods for export were scarce in relation to the demand. Quoting the president of the Incorporated Sales Managers' Association, Mr. Hillier said: "We find that a great many mistakes are being made in trying to sell in foreign markets. Wrong goods are offered or goods not properly, pleasantly or acceptably packed. There is a lack of understanding of a market's requirement and of the man handling the market."

It was necessary, he said, that the British manufacturer should establish very close liaison between his designers and consumer requirements by personal visits to the customer countries. Everyone realized that there were differences in the requirements of markets, but only when the differences were encountered within the space of a few hours were they really brought home and driven into the traveller's conscience.

There were two outstanding impressions, Mr. Hillier said, which were stamped on the minds of those who fly a great deal. The first was the sense gained by the air traveller of the co-existence of widely separated peoples and countries. The other was the sharpening of the impression of widely varying mentalities of different peoples, and the characteristics of countries and climates. He referred, in conclusion, to fares and the idea in the minds of some that they were excessively high. To counter any suggestion that fares did not represent good value, he gave as an example comparative travelling costs for a journey to South Africa by sea, which would take thirty-four travelling days, and by air, which would require only seven days. Taking into account the salary of a senior official of a company, and assuming it to be £6 a day, the total cost of the air journey would be £343 compared with £404 by surface transport.

ATLANTIC WEATHER-SHIPS

PLANS are going ahead for establishing the thirteen weather-ships in the North Atlantic. It will be remembered that arrangements were made at the P.I.C.A.O. conference in London last September for these observation stations to be in operation this summer. The United Kingdom is to be solely responsible for maintaining two ships, and jointly responsible with Norway and Sweden for one other. America will take care of eight, France one, and Holland and Belgium one between them. One of the American stations will be jointly maintained by Canada.

The primary function of these stations will be the constant observation of weather in mid-ocean, but they will also provide navigational aids for aircraft and make oceanographical and other scientific observations. Surface and upper air observations, which will be made by radio-sonde and radar at frequent intervals, will be transmitted to the meteorological office at Dunstable. The stations will also collect and retransmit weather reports received from merchant shipping.

A constant search and rescue organization will be automatically available, enabling aircraft and shipping in distress to home on the ships, which will be equipped with the neces-

CIVIL AVIATION NEWS

sary aids. It will thus be feasible for an aircraft in emergency to alight on the sea near enough for rescue to be effected. Special apparatus will be carried by the ships for this purpose. Four ex-Naval "Flower" class corvettes are being converted as necessary for the British stations. They are 205ft long and will have a loaded displacement of about 1,400 tons. They are built on whaler lines, burn fuel oil and have single-screw reciprocating engines giving a maximum speed of 16 knots. These ships were selected because of their relatively low purchase cost and cost of operation, and also for their excellent reputation for seaworthiness. Only twenty-one days will normally be spent in position which means that the ships will spend a total of about twenty-seven days at sea at a time. The crews will be civilians and will number on each ship about fifty-four including the meteorologists and special radio and radar technicians.

COALS TO NEWCASTLE

TWO Australians, Messrs. Tim Loneragan and Eric McIlree, have bought thirty-four Avro Ansons from the Australian Disposals Commission and are having them completely overhauled and converted for commercial use. Eleven of the aircraft have already been sold in Australia, but three will be flown to England to be sold by auction, and if the price is satisfactory the remainder will be brought here. The average stage distance on the flight from Australia will be 400-450 miles.

It is understood that Australia, expecting a long war in the Pacific, gave particular attention to the servicing of these Ansons, in view of the difficulties of replacement and spares. Consequently, when the war finished they were in excellent condition, and the majority had been fitted with the modified spar.

ARCTIC MET. STATIONS

THE Canadian Government will establish during the next three years nine meteorological stations in the Arctic. The stations will take observations of the weather and make long-range weather forecasts which, in the words of Mr. C. D. Howe, will be of inestimable value to Canadian national economy. Mr. Howe, the Minister of Reconstruction, made the announcement recently in the Canadian House of Commons. The Government, he said, hoped to enlarge the scope of the plan by increasing the exchange of weather information between Canada and Russia, and other northern neighbours. He estimated that the value of the service to aviation, agriculture and lumbering would be far in excess of the cost of establishing the weather station chain. America has agreed to help with providing personnel for the stations until such time as a sufficient number of technically qualified Canadians are available, but they will be under Canadian control. The most northerly of the stations will be at Ellsmere Island, about six hundred miles from the North Pole, and the main station will be at Melville Island, Winter Harbour. Mr. Howe expressed the hope that two of the new stations, one at Eureka Sound and the other at Winter Harbour, would be in operation this summer.

FIRE-FIGHTING DEMONSTRATIONS

AIRPORT Commandants and Aerodrome Managers from Ministry of Civil Aviation airfields were called together at Hurn Airport last week for instructional talks and demonstrations on fire-fighting and rescue. Demonstrations were given of the various chemicals, appliances and vehicles which are standard equipment at airfields. A Boston was set on fire and a 1945 Monitor and Crossley four wheel drive foam tender went into action, with the assistance of a C.O.2 tender and some water tankers. During the demonstration th petrol tank exploded. Talks were also given to the airport managers on their responsibilities, and information was given on the fire-fighting organization in the Ministry and on other items of equipment which would soon be made available.

R.A.F. LEAVING LYDDA

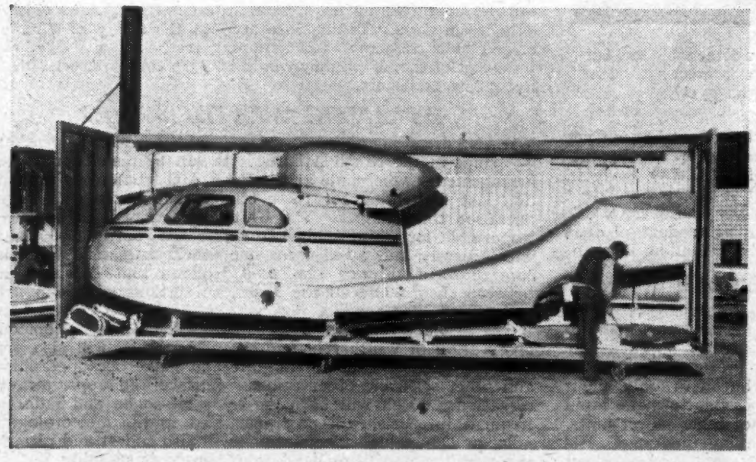
LYDDA AIRPORT, which was established in 1936, will be handed over to civilian control officially on June 1st, but R.A.F. Transport Command will continue to administer the airport until the Palestine Government are able to provide the necessary staff. The airport is one of the largest in the Middle East, and is situated in an important position on the routes to the Far East. About three hundred civil aircraft pass through each month. The R.A.F. are evacuating the large hotel, but this will not provide sufficient accommodation for passengers staying overnight. Steps are being taken to erect another building.

P.A.W.A. TRANSATLANTIC PROGRAMME

PAN AMERICAN AIRWAYS are proposing to make increases in scheduled operation across the North Atlantic during the coming summer months which are certainly ambitious. Greater facilities are to be provided for the expected rise in tourist traffic to this country, and in direct communications to other centres in Europe for business men and some tourists, for which London may be regarded only as a junction. P.A.W.A. are undoubtedly encouraged by the recent State Department ruling that passages out of America may be booked only when accommodation on this side and a return passage can be guaranteed.

There are at present ten flights a week into and out of London Airport by Pan American aircraft. This is to be supplemented gradually during the coming months until by June there will be a total of fourteen schedules per week each way between London and New York. One aircraft a week calls at Boston and Washington, but that service is to be doubled this month and increased to three a week in June. The weekly flight from La Guardia to Lisbon will be doubled on April 15th, and the service from La Guardia to Brussels will be increased to three a week by June. During May the weekly run from New York to Karachi will be doubled, but the two unscheduled flights from New York to Johannesburg will remain as they are. P.A.W.A. intend to base Dakotas in London and fly a service from London to Frankfurt, Prague and Vienna to connect with the transatlantic schedules, and so establish a direct route between New York and these three cities at a frequency of several flights a week. A DC-4 special cargo-carrying aircraft is to be made available for non-scheduled flights. The entire transatlantic service is to be operated with a total of eighteen Constellations.

The Clipper fleet during 1946 crossed the Atlantic 1,162 times, first of all with Skymasters. Constellations, however, came into service during February, 1946, and after a year of operation made nearly a thousand crossings carrying over 27,000 passengers, of whom 16,000 were on the west-bound route and 11,000 on the east-bound. June was the busiest month, when a total of 4,246 passengers made the crossing in 116 flights. There were no fatal accidents to either passengers or crews during the whole year.



FOR EXPORT: A Republic Seabee packed for shipment overseas. The wings are attached to the sides of the box and the entire aircraft is carried in the one case. The overall length of the Seabee is 28ft and the wing span is 38ft.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

AIR CREW LOG BOOKS

No Trace at Air Ministry Archives

REFERENCE the paragraph in *Flight* referring to an A.M.O. dealing with the retention of Flying Log Books.

Shortly after the A.M.O. was distributed I made application in the manner laid down for the retention of my own Log Book, and after three months' delay received a letter from Air Ministry Archives informing me that they had no trace of my Log Book in their Department!

I think there is no further comment necessary.

EX-ADJUTANT.

METEOROLOGICAL ASSOCIATION

Wartime Friendships to be Maintained

DURING the last war the ranks of the meteorological service of this country were reinforced many times over by men and women with various degrees of technical knowledge, engaged in the main in providing the weather forecasts required by the Services and departments of State or in plotting and interpreting the observations on which those forecasts and much other weather advice were based.

Many of those wartime recruits, Service and civilian alike, have now returned to peacetime jobs and with their dispersal has arisen a desire among many of them that the wartime friendships shall be maintained and fostered by the formation of an association of meteorologists, open to all who are, or have been, members of the Meteorological Office Staff or of His Majesty's Forces engaged on meteorological duties.

It is therefore hoped to inaugurate such a Meteorological Association at a meeting to be held at King's College, Strand, W.C.2 on Tuesday, April 22nd, at 6 p.m., and all those who are interested in its formation are cordially invited to attend. Will those who might join the association but are unable to attend the inaugural meeting please send their names and addresses to the Acting Secretary, Mr. D. C. Lloyd, Tolpits House, Tolpits Lane, Watford, *before* the meeting so that the acting officers may know the likely response.

P. A. SHEPPARD, Acting Chairman,
D. C. LLOYD, Acting Secretary,
W. P. OSMOND, Acting Treasurer.

UNIVERSAL POWER PLANTS

Not a Wartime Innovation

R. N. K. AVELINE'S letter in your issue of March 13th drew my attention to your article "Universal" Power Plant.

I agree with the above correspondent that the author appears to be under the impression that power plants of the "Universal" type are a wartime innovation. This is certainly not the case, since the Alvis Leonides which was exhibited at the 1939 Brussels Aero Exhibition provided everything now claimed for the post-war unit.

The Leonides was provided with interchangeable pick-up points, cowlings and exhaust systems, and all electrical systems and pipe connections were grouped in the vicinity of the aircraft fireproof bulkhead and connected to those of the aircraft by means of quickly broken group connections.

Since the idea was first considered, it has always been realized that the "Universal" plant was more applicable to radial than in-line engines, and, in fact, in adopting the "Universal" scheme, the in-line engine sacrificed one of its greatest claims to superiority, namely, a smaller frontal area than the equivalent radial installation.

One of the features stressed is the use of an accessory gearbox, but this can be found to be a little troublesome on the smaller four-engined aircraft as the space taken up by this behind the fireproof bulkhead makes the efficient housing of the undercarriage behind the inboard power units difficult.

In the case of the Alvis Leonides, this undercarriage difficulty is overcome by the use of a detachable accessory gearbox of variable design fixed to the rear of the engine.

A point which must be stressed is that the "Universal" power plant should be available to the aircraft designer before his work commences, otherwise it is almost certain that some vital feature will defeat the object.

Publicity Manager, Alvis, Ltd. L. I. W. LIQUORISH.

GYROSYN COMPASS

Principles of Operation

I NOTICE that in an article on the Gyrosyn compass, published in *Flight* on the 13th March, a contributor, in discussing the principles of operation of this type of compass, refers to an A.C. which "alternately pulses the earth's magnetic lines of force in and out of the three spokes" (p. 208).

I would like to point out that this explanation, though widespread, is completely erroneous. The core, having magnetic properties similar to perm alloy, has a flux density (B)/field intensity (H) characteristic which in shape is not unlike the ordinary electronic triode anode current (Ia)/grid volts (Vg) characteristic. The magnitude of the horizontal component (H) of the earth's field, and the angle the "spoke" makes with it, determines the operating point on the B/H curve in a similar way to the grid bias determining the operating point on the Ia/Vg curve. Hence, presumably, the nomenclature *Flux Valve*. The principle of working of this, and similar types of compass, has been accurately explained in "R. & E. Technical Note No. Inst. 783," dated July, 1943, which deals with the Pioneer Gyro Fluxgate Compass. L. F. STANLEY, M.Sc., A.R.C.S.

Empire Air Navigation School.

(The explanation given is approximately correct and was deliberately phrased to make it readily understandable to the "un-electric" reader. It is agreed that the action is analogous to an electronic triode valve working as an anode bend detector, as saturation (by the exciter coil flux) is fundamental to the principle of operation.—ED.)

LANDING AID

Infra-red Illumination of Runways

THERE have been many articles in *Flight* lately concerning the use of Radar in its various forms in connection with aircraft, either for the purpose of navigation or as a landing aid. A great deal of work has been carried out on the subject but there does not seem to be any instrument which can give the pilot visual aid when he is coming in to land in bad weather.

It is true that many of the latest aids will help him to obtain a good glide path and render his landing easier, but at the same time there is the psychological factor of wanting to see where he is landing. For this purpose I would suggest the use of infra-red rays.

It will be recalled that during the war great steps were made in the application of the infra-red rays, mainly by Germany and America. These principally found application in the use of gunnery at night and in foggy weather. The method by which this was used was an infra-red searchlight throwing a beam of light which was normally invisible to the naked eye, but when the correct type of glasses were worn a very clear image appeared. These weapons were used with a fair amount of success, and the fact that they were used for gunnery, which requires great accuracy, gives proof of their efficiency.

I would therefore suggest that the following two methods be investigated with a view to helping the landing of aircraft:

(1) An infra-red searchlight be fitted to the nose of the aircraft and upon the pilot being shown the correct glide path, this can be put into operation and assist his landing.

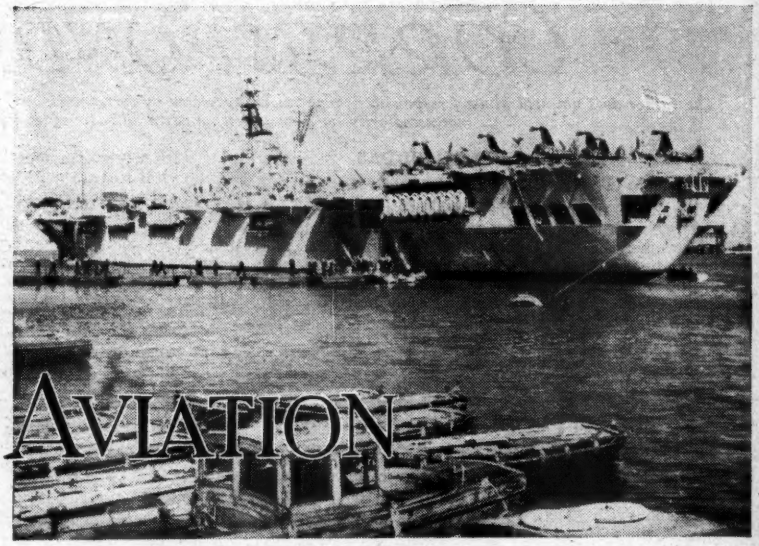
(2) Infra-red lamps should be sunk in the ground adjacent to the runway and also fixed in prominent positions on the terminal buildings to give a more diffused light, so that when looking through the glasses he would get a good picture of the runways and terminal buildings.

It is not intended that the above idea should replace Radar, which is a most valuable aid, but should prove of assistance in a field where Radar can only give instrument help, i.e., at the actual moment of landing.

As with my previous communication, I am writing a similar letter to the Air Registration Board and the American Civil Aeronautics Administration, in the hope that this idea will help to solve some of their problems.

HENRY J. MANNERS.

Royal Air Force and Naval Aviation News and Announcements



SHORE LEAVE: Officers and men of H.M.S. *Venerable* go ashore at Port Said. Ranged on the deck are folded Seafires.

SERVICE AVIATION

Award

THE King has been graciously pleased to approve the following award:—

GEORGE CROSS

The Reverend Herbert Cecil Pugh, M.A., Royal Air Force Volunteer Reserve, deceased.

The Reverend H. C. Pugh, after seeing service in this country, was posted to Takoradi and embarked on H.M.T. *Anselm*, carrying over 1,300 passengers for West Africa at the end of June, 1941. She was torpedoed in the Atlantic in the early hours of July 5th, 1941. One torpedo hit a hold on Deck C, destroying the normal means of escape. Mr. Pugh came up on deck in a dressing gown and gave all the help he could. He seemed to be everywhere at once, doing his best to comfort the injured, helping with the boats (two of these were rendered unserviceable as a result of the explosion) and rafts, and visiting the different lower sections where the men were quartered.

When he learned that a number of injured airmen were trapped in the damaged hold, he insisted on being lowered into it with a rope. Everyone demurred because the hold was below the water line and already the decks were awash and to go down was to go to certain death. He simply explained that he must be where his men were. The deck level was already caving in and the hold was three parts full of water so that when he knelt to pray the water reached his shoulders. Within a few minutes the ship plunged and sank and Mr. Pugh was never seen again. He had every opportunity of saving his own life, but without regard to his own safety and in the best tradition of the Service and of a Christian Minister he gave up his life for others.

Production Sea Hornets

INCREASED fin area, in the shape of a dorsal fillet, will characterize future production versions of the de Havilland Sea Hornet.

There appears to be no good reason why a two-seater version of the Sea Hornet should not be developed for night fighting or other duties.

BULSTRODE PARTY: Lady Coningham chats with A Cdre. Boyle at a cocktail party given by the R.A.F. Staff College, Bulstrode, and attended by Air Attachés, senior officers of the Services and representatives of the Foreign Office.

Canadian Vampires

THE Hon. Brooke Claxton, Canadian Minister of National Defence, has stated that the R.C.A.F. would have this year the equivalent of about eight squadrons including Vampires (if these arrived this year). Canada at present has only two jet aircraft (Meteors), which are undergoing sub-zero tests at Edmonton.

R.A.A.F. "Libs." for Antarctic

THE Royal Australian Air Force is to undertake a series of long-distance flights to the Antarctic, using Liberators. The first will be in charge of G/C. Deryck W. Kingwell, said to be the youngest Group Captain (he is 27). It is proposed to study weather conditions and crew fatigue. A Catalina will "stand by."

R.A.F. Sport Abroad

A TEAM from No. 91 Group, Bomber Command, has lately played a series of squash matches in Copenhagen, and arrangements are being made by the R.A.F. Fencing Union to receive a visit from a French Air Force team during May, to be followed by a return visit to Vichy in July. An Association football team from No. 47 Group, Transport Command, recently went to France to play a French Air Force team.

Nottingham University Squadron Badge

A CDRE. B. V. REYNOLDS, C.B.E., A.O.C. 64 (N.R.) Group, presented the squadron badge, recently approved by H.M. the King, to Nottingham University Air Squadron at a ceremonial parade on March 26th. After the inspection of ex-Service officer undergraduates, cadets and staff numbering about 60, all of whom he questioned individually, he handed the badge to the Chief Instructor, F/L. Cornish.

The badge is a sheaf of arrows in the usual R.A.F. emblem, the motto being "Strength in Reserve."

The Air Commodore, the guest of honour at the Squadron Dinner which

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followed, spoke of the U.A.S. being the main source of man-power for the new technical branch of the R.A.F. Other speakers were Professor Peers, O.B.E., M.C. (Acting Principal, University College, Nottingham), Capt. J. Choate and F/O. Harris

St. Dunstan's and the R.A.F.

SINCE last May home and overseas commands of the R.A.F. have raised £131,180 10s 6d for St. Dunstan's, and the whole of the money is to be spent in various ways over a period of forty years in the interests of men and women blinded on war service. Part is to be spent on establishing, furnishing and maintaining a club at the St. Dunstan's permanent headquarters in London. The club will be called St. Dunstan's Club and a plaque will be placed in it commemorating the R.A.F.'s gift.

Photography from "Jets"

REFERENCE has already been made in these columns to experiments with jet-propelled aircraft in the P.R. rôle. Many problems have been encountered, not the least being that of taking photographs at speeds greatly in excess of those attained by previous P.R.U. machines.

To secure a photograph at great speed without movement a very short exposure is needed. With the present type of mechanically driven camera, which takes a photograph at set intervals, exposure speeds have been reduced to their minimum. For any shorter exposure the mechanism has not enough time to set itself before the next picture is taken.

There are two solutions (a) to produce a film so fast that it records an image with infinitesimal shutter speeds, or (b) to leave the shutter open and use a continuously moving film. At the R.A.F. Central Photographic Establishment at Benson the moving film camera has been tried with some success.

Another problem is one of navigation. The photographic reconnaissance pilot has to navigate his aircraft to his objective and secure the photographs of a defined and often limited area, so radar and radio navigation will have to take the place of the older and slower processes.

Finally there is the problem of night photography at high altitudes. Successful night photographs have been taken at heights of 15,000 to 20,000 feet, but some of the new jet aircraft will be operating at even higher altitudes. Not only is there the problem of speed, which is even more important in night photography than in day, but the higher the aircraft flies the greater is the amount of illumination required to record an image on the film, and consequently the greater the weight and size of the illuminating medium, whether this be flash bomb or flares. Experiments are at present proceeding in an effort to find a solution to this difficulty.

These are but a few of the problems confronting those who are dealing with the possibility of using jet aircraft for photographic reconnaissance flying. There are others, such as the effect of low temperatures on the film, condensations due to rapid changes of height, haze penetration at great heights, and so on, and in the Tactical Wing at R.A.F. Benson is the Photographic Reconnaissance Development Unit whose job it is to carry out the experiments on these and other problems set from time to time by the Photographic Reconnaissance Development Committee under the chairmanship of the Deputy Director of Photographic Operations.

ROCKETEERS : Messrs. R. W. Pye and W. A. S. Butement with G/C. W. H. Fresson on arrival in Australia in connection with guided missile tests on the range soon to be established.

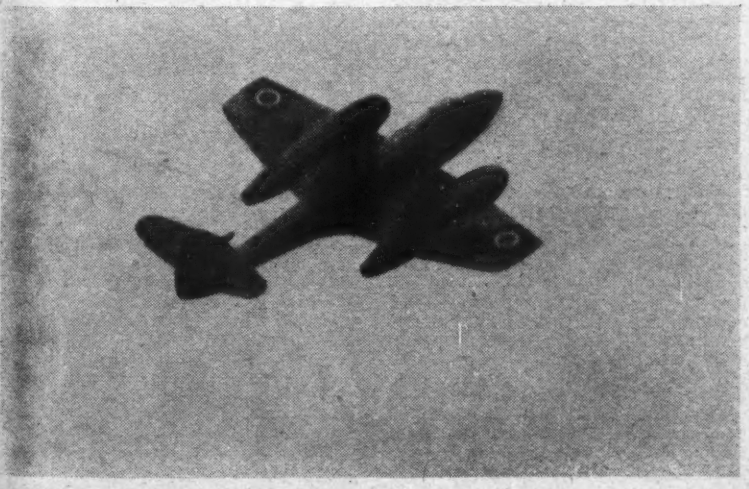
Thirst Quenchers

THE scheme by which the R.A.F. supplied drinking water to Londoners whose water was cut off because of floods has been completed. In four days 100 mobile R.A.F. tankers, collected from maintenance units and based on R.A.F. Station North Weald, delivered 520,000 gallons of water to householders.

Sir Roderic Hill on Technical Efficiency

AIR MARSHAL Sir Roderic Hill, Air Member for Technical Services, who has been discussing with overseas officers the new Technical Branch of the R.A.F. Organization which came into being on the 1st of January, said in Ceylon recently: "The principle on which it is based has already been applied by the R.A.F. during the war. Not only the Technical Branch but General Duties Officers have been most interested and will, I am sure, do all they can to assist the development of organization on a practical basis. In my opinion the importance of the Technical Branch will increase as time goes by. But technical efficiency in the R.A.F. is not an end unto itself, and is important only in so far as it promotes operational efficiency. As equipment becomes more varied and complex a heavier burden will be thrown on the technical side."

Concerning jet engines Sir Roderic thought it unlikely that they would, in the near future, supersede piston engines



7,800 FT/MIN. : A short-span Gloster Meteor IV climbing from sea level. Some news of Meteor developments, particularly of the new Trainer, appears on page 321 of this issue.

AEROFOIL FLAPS : The Fairey Youngman flaps on the Firefly, the Mark I version of which is shown just before touch-down, are not only of great benefit at take off and landing but improve cruising performance and manoeuvrability.

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in R.A.F. aircraft, especially in the heavy-load category, for there were many technical design problems which had first to be overcome.

Commenting on technical achievements within the Commands he had visited Sir Roderic said: "I consider that R.A.F. Commands are doing excellent work, in spite of the many difficulties due to shortage of man-power consequent upon demobilization. The Halton and Cranwell-trained apprentices, commissioned or non-commissioned, have once again shown fine qualities and proved to be the backbone of our Technical Organization."

Boy Entrants

BOYS between 15 and 17½ may now volunteer to join the R.A.F. under a new scheme—the Boy Entrants' Scheme. They will be given technical training in a skilled trade and will sign on for service and training up to 18, and for 12 years' service from 18, part of which may be on the Reserve. The trades open under the scheme are: Aircraft Finisher, Telegraphist and the mechanics' trades of Airframe, Armament, Electrical, Engine, and Instrument Mechanics.

A boy entrant's prospects of a commission are the same as for other regular airmen who are not apprentice-trained. Some will also be chosen for training as pilots and navigators, with the chance of a commission in the General Duties branch, or of re-engaging to complete service for aircrew pension. During this time they will still be eligible for commissions.

It is hoped to enlist over 1,200 boys a year under the scheme, the first selection to be made this May. All candidates must be nominated, the simplest methods being through their Headmasters, the Commanding Officer of their A.T.C. Squadron, or the Local Juvenile Employment Officer.

The training for boy entrants will normally last 18 months and those who are below 17½ by the end of it will be posted to specially selected units. Telegraphists will be trained at R.A.F. Compton Bassett, Wiltshire, Armament Mechanics at R.A.F. Kirkham, near Preston, Lancs, and other trades at R.A.F. Locking, near Weston-super-Mare, Somerset

New Barrack Blocks

STEPS towards the realization of the policy of providing improved barrack blocks for the R.A.F. have already been taken, and a new type of accommodation at Boscombe Down is being built to a design based on the provision of separate cubicles, specimens of which have been exhibited on trailers visiting R.A.F. stations throughout the country.

Nine of these new barrack blocks, each housing 100 men, are to be erected at Boscombe Down, and in the near future similar blocks will be built at seven other stations. The designs provide for a separate cubicle containing bed, built-in wardrobe, writing table and bookcase, for 84 per cent of the airmen accommodated. It is known, however, that some men prefer to share a room with friends, and for the remaining 16 per cent the designs provide for larger cubicles, each accommodating four men. New dining rooms of an improved type will also be erected at Boscombe Down.

Air Defence Units

MEMBERS of the W.A.A.F. on release from service, former members of the W.A.A.F., and women who have not previously served will shortly be able to volunteer to join the W.A.A.F. Reserve for service in Air Defence Units of the Auxiliary Air Force.

Officer volunteers must be at least 20 and not more than 34 years of age, airwomen volunteers at least 18 and not more than 37, with exceptions in special cases. Officers will normally undertake to serve on the W.A.A.F./R. List for as long as their services may be required (airwomen initially for two years), but an officer or airwoman may resign her appointment at any time on giving the required notice.

The programme lays down 15 days' continuous, 30 hours' non-continuous, and six week-ends non-continuous training as the minimum, and allows for an additional 60 hours' non-continuous training of which at least 48 hours must be at four specified week-ends.

To date, nine Air Defence Units have been formed, and so far only former members of the R.A.F. have been invited to volunteer. Local announcements will be made when recruiting is ready to begin for women. Recruiting to these units at present is open to former members of the R.A.F., who should apply to the following addresses:—

Hampshire : The Adjutant, Air Defence Units (A.A.F.), R.A.F. Ibsley (near Ringwood).

Kent : The Adjutant, Air Defence Unit (A.A.F.), R.A.F. Sandwich (near Margate).

Middlesex : The Adjutant, Air Defence Unit (A.A.F.), H.Q. Fighter Command, R.A.F. Bentley Priory, Stanmore.

Norfolk : The Adjutant, Air Defence Unit (A.A.F.), R.A.F. Horsham St. Faith (near Norwich).

Northants : The Adjutant, Air Defence Unit (A.A.F.), R.A.F. Langtoft (near Peterborough).

Nottingham : The Adjutant, Air Defence Unit (A.A.F.), H.Q. No. 12 Group, R.A.F. Watnall, Notts.

Suffolk : The Adjutant, Air Defence Unit (A.A.F.), R.A.F. Trimley Heath (near Ipswich).

Sussex : The Adjutant, Air Defence Unit (A.A.F.), R.A.F. Wartling (near Eastbourne).

East Riding : The Adjutant, Air Defence Unit (A.A.F.), R.A.F. Partrington (near Hull).

Reunions

EX-MEMBERS of 1340 Flight (Cannanore, India) should write for details of a proposed reunion dinner (all ranks) to A. Soundy, 41, Highlands Rd., Leatherhead, Surrey.

* * *

A reunion dinner for officers and aircrew of No. 123 (East India Fund) Squadron will take place on May 3rd at 19.00 hrs at Oddenino's Hotel, Regent Street, London. Personnel interested should contact J. H. Gross, 27, South Avenue, Gillingham, Kent.

* * *

No. 66 Squadron Air Defence Cadet Corps and Air Training Corps Old Comrades' Association will hold a social evening on April 26th, at 6.30 p.m., at Sylverdale Hall, Sylverdale Road, Croydon. All ex-officers, instructors and N.C.O.s are invited. For further information contact J. W. Ellis, 33, Outram Court, Outram Road, Croydon.

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